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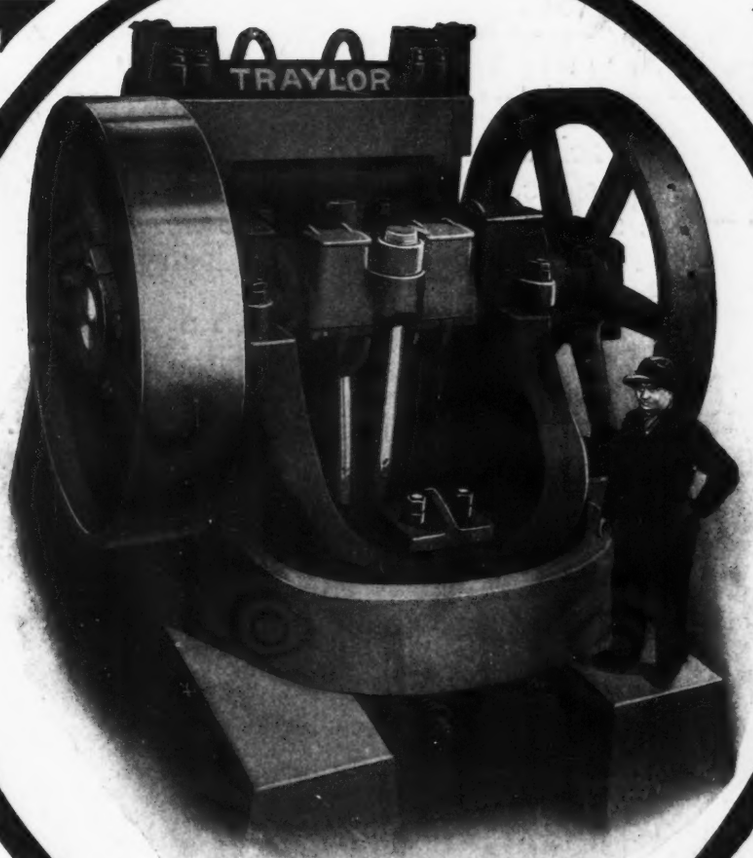

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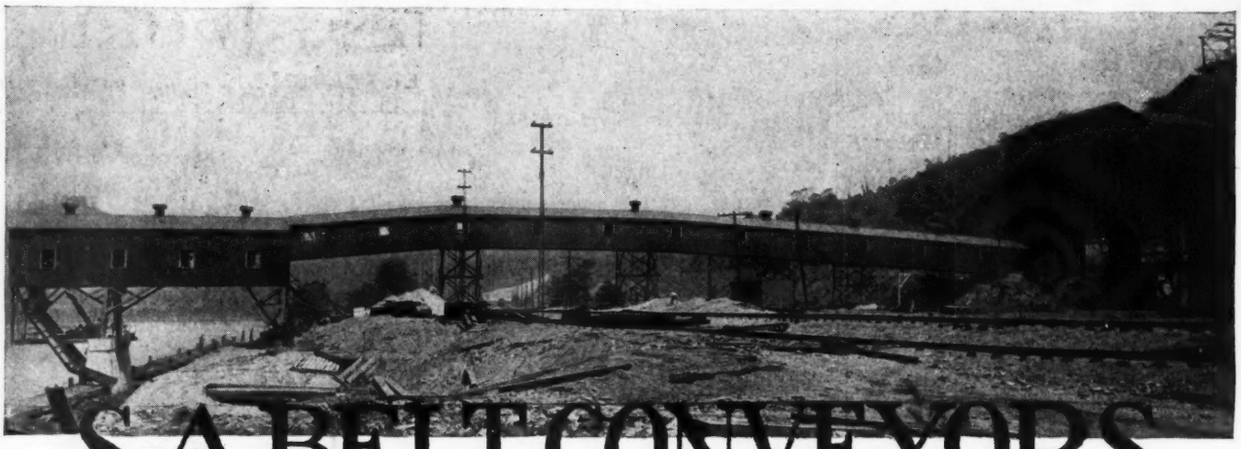

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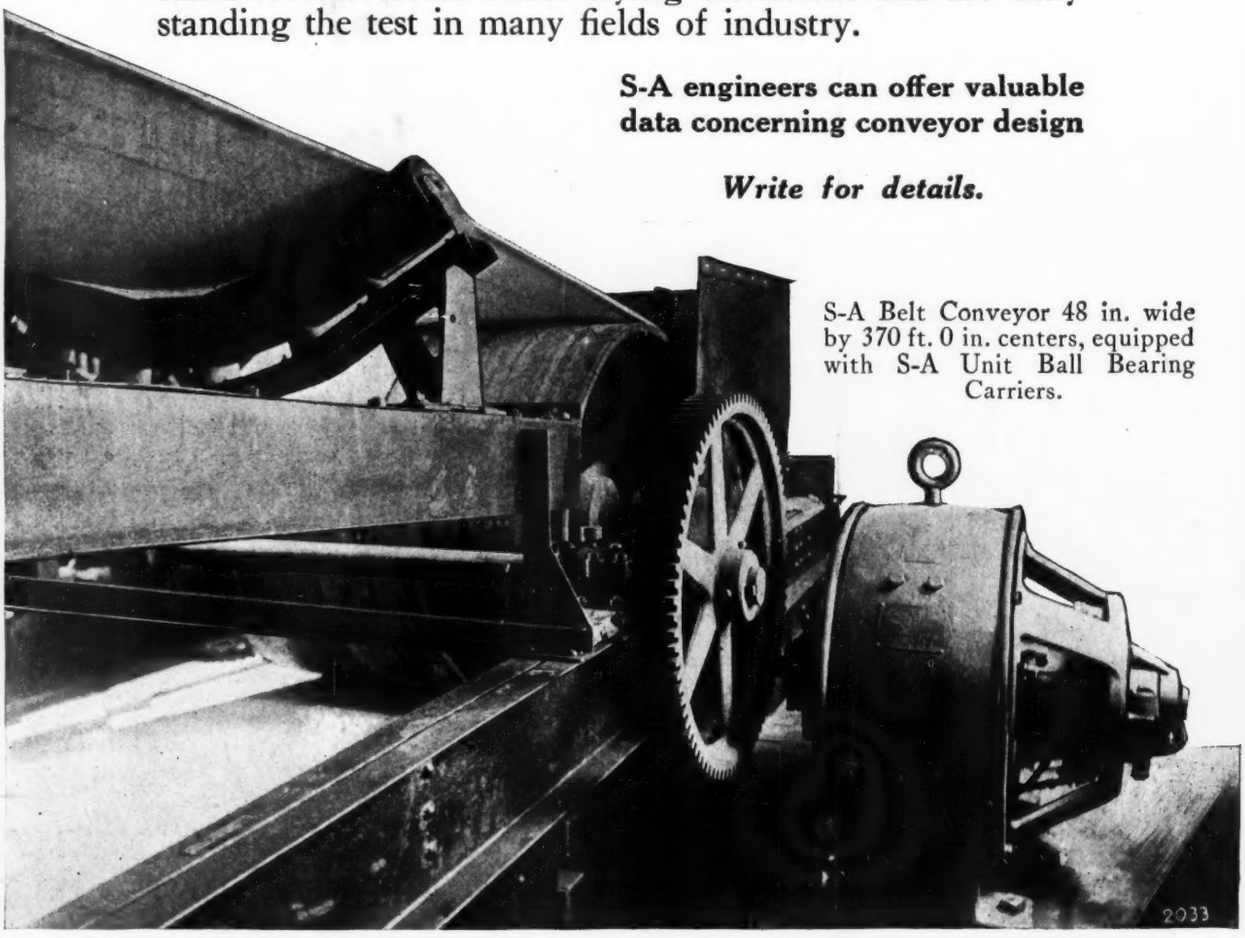

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Engineering and Mining Journal

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Volume 108 | New York, Saturday, August 9, 1919 | *Number* 6

Signs of the Times

IF THE handwriting on the wall can be read aright, public control of many utilities will be an accomplished fact within the next decade. Insofar as ownership and operation by Federal authority are concerned, we are further away from that than we were twenty years ago. With few if any exceptions, the public wishes to see no more of Federal mismanagement and extravagance. Whether justly or not, the people attribute many of their grievances, high costs, and inadequate service during and after the war to the Government, and ask that former relations be resumed.

On the other hand, the public has learned that the Government can control much of the business on which our lives and happiness depend, and it will demand that this control be exerted. Previous to the war and during it we have had the experience of several overdoses of control, where large quantities of the remedy brought about conditions worse for the public than was the original disease. The Interstate Commerce Commission has done some excellent work, but it has gravely impaired the credit of our transportation lines. The Federal Trade Commission, established as a guide and adviser to the business men of the country, has developed into a prosecutor of successful business enterprise.

Whether Federal control will be limited to public-service corporations or will extend to various types of industry, no one can tell. Today the public is not finding fault with the former, but feels more than unkindly toward the purveyor of the necessities of life.

It is of the highest importance to American business that the tendency of the times be recognized, so that men of business will co-operate with legislators to produce intelligent and reasonable regulations. Opposition to the principle or disregard of legislative action will lead to the enactment of oppressive control that will throttle business to suffocation.

Henry A. Wheeler, President of the Chamber of Commerce, in an address delivered in Chicago April 29, suggested that cordial acceptance by organized business of the principle of larger public regulation may tend to accomplish a number of desirable ends:

1. To set aside definitely all public thought of the necessity for Government ownership and operation of any of the instrumentalities of commerce so long as regulation can be assured to preserve the public from being exploited.

2. That opposition will be removed to the broad application of the rule of reason wherein agreements between business men made in the public interest would not be regarded as criminal acts.

3. That all business, whether it be manufacturing, mining, or farming, shall enjoy a clear interpretation of the measure of co-operation and combination permissible in the public interest, and thus remove one of the most obstructive features of our pre-war period in which the business man found no authority from whom he could secure definite approval or disapproval of proposed agreements with his fellows.

4. That the larger responsibilities resting upon the Federal agencies charged with the guidance of business, and of safeguarding the public, would compel greater care in the selection of personnel, and would invite acceptance of Federal appointments by men who, in the past, have not felt inclined to separate themselves from their own interests for a service not recognized as constructive in any large degree.

The nationalization of coal mines has already been suggested. Some control of our fuel supply is sure to come, and in due course supervision and control of the production of metals may follow.

It will be well if miners heed the suggestion and take active part in the consideration of any regulatory legislation that is proposed.

Engineers, Politics, And Civic Activities

TECHNICAL societies all over the country have recently been discussing, individually and collectively, the lack of that intimate touch which should exist between engineers on the one hand and politics and civic activities on the other. Something is wrong somewhere, for it is true that the engineer is distinguished by his absence, and not on account of his leadership, in matters politic and civic.

At the conference called by Engineering Council in April to discuss the creation of a Department of Public Works, M. O. Leighton, of the National Service Committee, spoke some unpleasant truths that will bear repetition. Among other things he said:

"But I really think that unless a change comes over you engineers, the organization in Washington that attempts to guide you and keep you informed, and expects your help in return, is going to have a very hard row to hoe. I don't suppose that there is one engineer in a hundred who realizes how poorly engineers are regarded in Washington so far as potentiality in political affairs is concerned. You don't stand as high as the undertakers, and when you are compared with trade unions you are so far behind that no one knows you exist. I sometimes think the reason is that you don't care for anything better, and again it seems to me that you don't know the conditions. If you did you would remedy them yourselves as a result of personal pride.

"Some of us remember when a committee of most distinguished engineers went to Washington to give advice to a Senate committee on an important engineering matter. You would have supposed that the cream of the engineering profession of the United States would have secured a respectful hearing. They barely

got inside the door of the committee room. The Senate committee promptly adjourned. They wouldn't treat a plumbers' union like that, nor a committee from the American Bar Association, nor yet a conclave of Presbyterian ministers. They have fallen into the habit of discounting engineers. The facts are, you don't count at all, and it is simply and solely the result of your indifference as illustrated by the response to the invitation of Engineering Council to come to this conference.

"I realize that I am talking to the wrong people. Your societies came forward and you are here, but you are the exceptions that prove the rule."

Committees may be appointed having upon them the best men in the profession, and they may be given full power, yet they accomplish little or nothing. Names count for nothing in a campaign. Vital, active, aggressive force must be used to make an impression. Without these, and the individual interest that makes them possible, there will be no results.

Lack of influence of engineers as a body is essentially due to lack of organization for co-operation, and the latter does not exist because the individual members making up each body are not interested in those things that may be done through co-operation.

Mr. Leighton further pointed out that as a first step in co-operation it was necessary to record the existence, membership, and activities of American engineering societies. He had been working for three months upon this with the assistance of the best-informed associations, and had gathered a list of only about 180 out of 300 or 400 probably existing. In closing he used these words:

"Why don't you authorize that Washington committee to spend a little money to dig out these engineering societies and get them to work? In other words, my friends, why don't you use the intelligence of a carpenters' union or a plumbers' union or the American Federation of Labor? Sometimes it seems as though you are temperamentally unfit for that kind of a job. Perhaps you are not; but, believe me, gentlemen, you act as though you were. Influence can't be acquired without participation. I believe influence means influx. That is what the engineers lack—influx. You don't flow into things. You stand on the outside looking in."

And Mr. Leighton was most heartily applauded for the scolding that he had administered.

The Raw Material In College Work

TOO many discussions of educational matters fail to bring to bear upon the question of education the most vital element involved—the raw material with which the educator has to deal. In university work, the entering student is supposed to have passed the high school and to have acquired habits of study and application. He is presumed to have given some serious thought to the selection of a life work.

In addition, students fall into one of several groups—one group characterized by men who have no objective, and are indifferent to the work in which they have enrolled; another composed of those on pleasure bent, and who are willing to sacrifice their own and their neighbors' time to accomplish their objective, and the last, and by far the smallest group, consisting of men who have a definite object, who realize the value of their time and who desire to apply themselves earnestly to the work in hand. The percentage proportion of entrants falling into each group varies in different institutions. Men do not necessarily permanently adhere to the group in which they start, although once a man starts in the preferred class, he usually remains in it.

Indifferent men sometimes develop and change radically for the better. In considering raw material one must never fail to remember that youth is in the plastic state and that the man is in process of development. Wretchedly poor material may suddenly change into better. A student who has been a trial throughout his college work, and who has just scraped through, may yet develop into a useful man. Sometimes a graduate finds himself only after some bitter experience which directs his attention to his own shortcomings and stimulates in him a desire to begin in a new and better way.

A high quality of finished metal requires good raw material as the starting point, else great skill and knowledge will be required in bringing it to the requisite standard. Similarly, a college may graduate a high-grade man if it starts with good raw material. But the unskillful handling of a high-grade iron ore may produce an indifferent steel. So it is in an educational institution. Not only must there be a careful selection of good raw material, but there must also be competent handling of it, else such material may be spoiled in the making. Thus the two essentials, good raw material and competent instructors, may be taken as the prime requirements for the production of high-grade men, whether they be mining, civil, electrical, or mechanical engineers.

In striving for large numbers of students educational institutions are prone to overlook the fact that by so doing they often increase their own difficulties in producing a high-grade or even a fairly satisfactory graduate. First-class men are submerged in the mass of indifferent ones. It is like mixing rich ore with poor ore. On the other hand, however, the presence of a few good men in a class benefits many of the less able and tends to sweeten the product, although at the expense of the more competent men. It is for this reason that any plan for the segregation of such men generally from the ordinary run of class work would meet with objection. Nevertheless, for the benefit of these men additional work under the direction of the best leaders of the educational staff should be provided in each institution, and they should be relieved from a corresponding proportion of less important work. Recognition in this way would have an excellent influence upon all of the students.

International Trade Conference

AN INTERNATIONAL TRADE CONFERENCE will be held in Atlantic City during the week of Sept. 29 under the auspices of the Chamber of Commerce of the United States. Great Britain, France, Italy, and Belgium have been asked to participate, and have accepted the invitation. After the conference, which will be attended by a large number of American business men, the foreign representatives will tour the United States for about a month under the guidance of the National Chamber.

The main purpose of the conference is to acquaint American business men with present conditions abroad and bring about closer relations with our European as-

sociates in the war. Unless European countries can soon begin production on a large scale, they will be faced with danger of being unable to pay for food and clothing and inability to reduce their war debts.

America must come to the aid of these countries, not only because of their unfortunate condition but to protect our own social and financial interests at home.

Satisfactory Work of the War-Minerals Relief Commission

THE selection of Philip N. Moore as a member of the War-Minerals Relief Commission was a particularly happy one. Mr. Moore is a well-known mining engineer, and has the esteem and confidence of his brother engineers. Having a thorough knowledge of mining operations, he was enabled to bring out the testimony of the miners and mining-company officials who presented their cases at the hearings which were held in San Francisco, July 5 to 25, and reported on page 238 of this issue of the *Journal*. More than this, those who presented their cases were immediately at their ease as soon as they recognized that here was a man who not only understood the language and technical terms which they used to describe their operations, but who also was sympathetic with them.

Mutual understanding breeds confidence, and we believe that Mr. Moore's presence upon the commission and the way that the commission has conducted its hearings have created a feeling that, whatever the decision may be, claimants have been fairly and squarely heard, and that every facility was given them to present their claims. The two other members of the commission, John F. Shafroth and M. D. Foster, served on the committees of Mines and Mining, the former on the Senate committee and the latter as chairman of the House committee. Both bring to the commission a full knowledge of mining legislation.

Service Rendered

WHEN the United States Government has paid all of its war bills and wiped the slate clean, there will still remain an obligation that will not appear of record. This liability is large, but it is not measurable in dollars and cents. We refer to the debt that the Government owes to hundreds of men connected with the business of mining and metallurgy. Other men have served equally well in their civilian capacities, but our knowledge of the work of miners and metallurgists is more intimate.

Literally thousands of men participated in the national service, held themselves subject to call without regard to personal inconvenience or business interests, and responded without hesitation when needed by the war agencies of the Government.

This form of patriotic service merits more than passing mention, because it was offered with no thought of public recognition or possibility of applause; it carried no Government commission, donned no uniform, nor hoped for inclusion in that long and honored list of Government appointees at a dollar a year.

The men of the mines and mills, privates behind the lines, have contributed as much to the making of history as those who went over the top at the front, and without their aid our first line might have had little more strength than was developed by the vast armies on the Eastern front. They will not be cited, nor will they wear chevrons that the public may know of their services.

There may be no appropriate manner in which to give public recognition of such service, but it will not go unrewarded. The work of some is known to their fellows, and has already commanded an admiration and a respect deeper than can be created by the wearing of insignia; but of still greater moment is the fact that the worker has the consciousness that he saw an opportunity for service and rendered that service to the best of his ability. He alone knows the sacrifice involved. His citation will come from a higher source and be of greater value than honors from a department or generalissimo.

A Responsibility and An Opportunity

IN A LETTER to college and university officers in this country the Commissioner of Education writes: "The higher educational institutions of western Europe have been prostrated by the war. Large numbers of the leading scientists and of the younger men whose scientific careers were just beginning have been killed. Because the intellectual resources of the United States have not been similarly drained, the Western nations are looking to the United States to assume the responsibilities of leadership in education and in science."

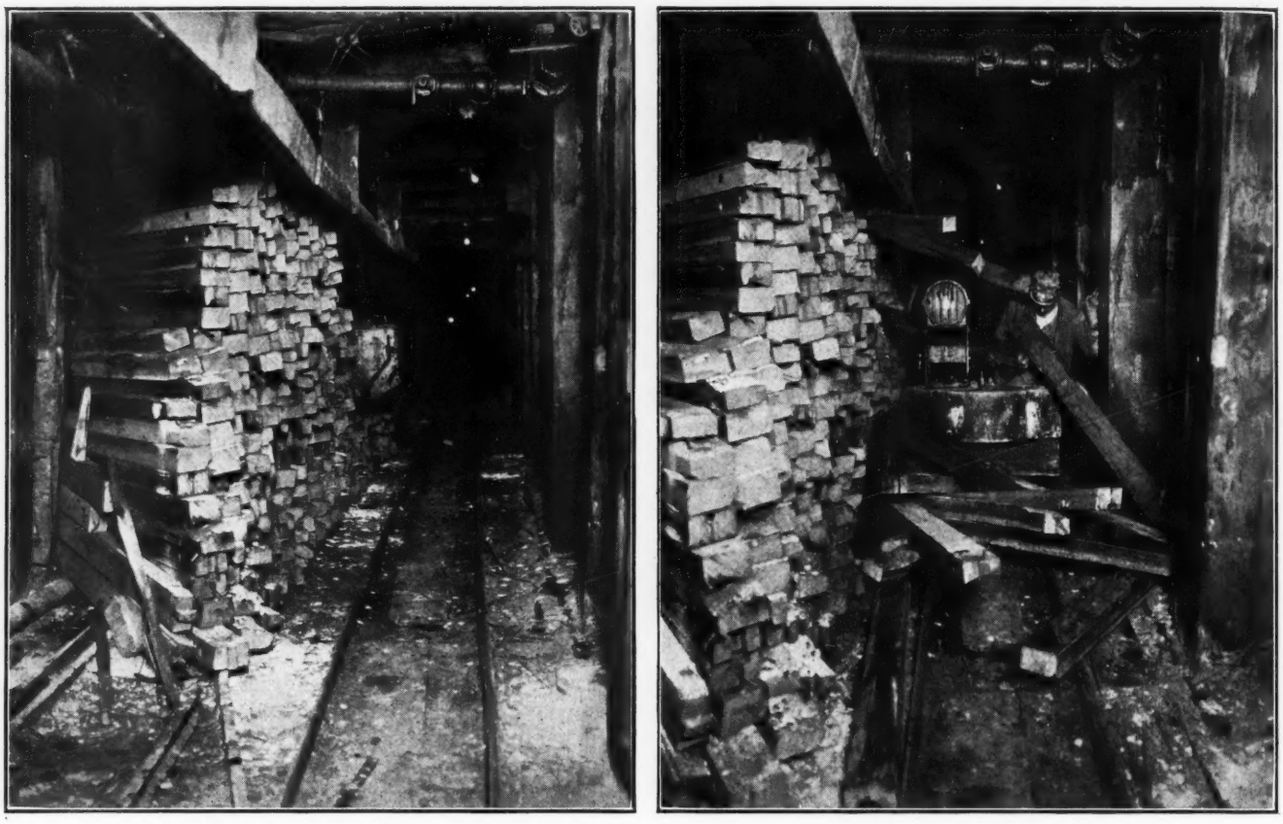
Will the colleges, universities, and technical schools of the United States seize this opportunity to help build up the civilization of the future by opening wide their doors to students from all over the world? Will Germany be allowed to re-establish her educational prestige and draw students to her, first from the Near East, and later from other countries against whom she fought in the war? Are we willing to admit that there has been any justification for Germany's assumption of educational prestige at any time during the past quarter of a century?

These questions are put squarely up to our institutions of higher education. Will they appreciate their responsibility and opportunity? Some of our schools are giving the problem serious attention. All should do so. Students in foreign countries should be made familiar with educational opportunities in the United States.

A Letter From Mexico

OUR presentation of the facts in connection with the murder of Theodore Patterson, manager of the Aranzazu copper mine of the Mazapil Copper Co., as published in the *Journal* of Aug. 2, has been acknowledged by the Department of State and the chairmen of committees of the House of Representatives to whom the information was transmitted, and we are advised that the matter will receive proper attention.

We are informed that, on several recent occasions, the American Embassy at Mexico City, under instructions from the department, has urgently requested the Mexican Foreign Office to take action looking to the adequate protection of the property and employees of the Mazapil Copper Co. With regard to the murder of Mr. Patterson, who was a British subject, the department is advised by the American Consul at Saltillo that several persons have been arrested in connection with that crime.



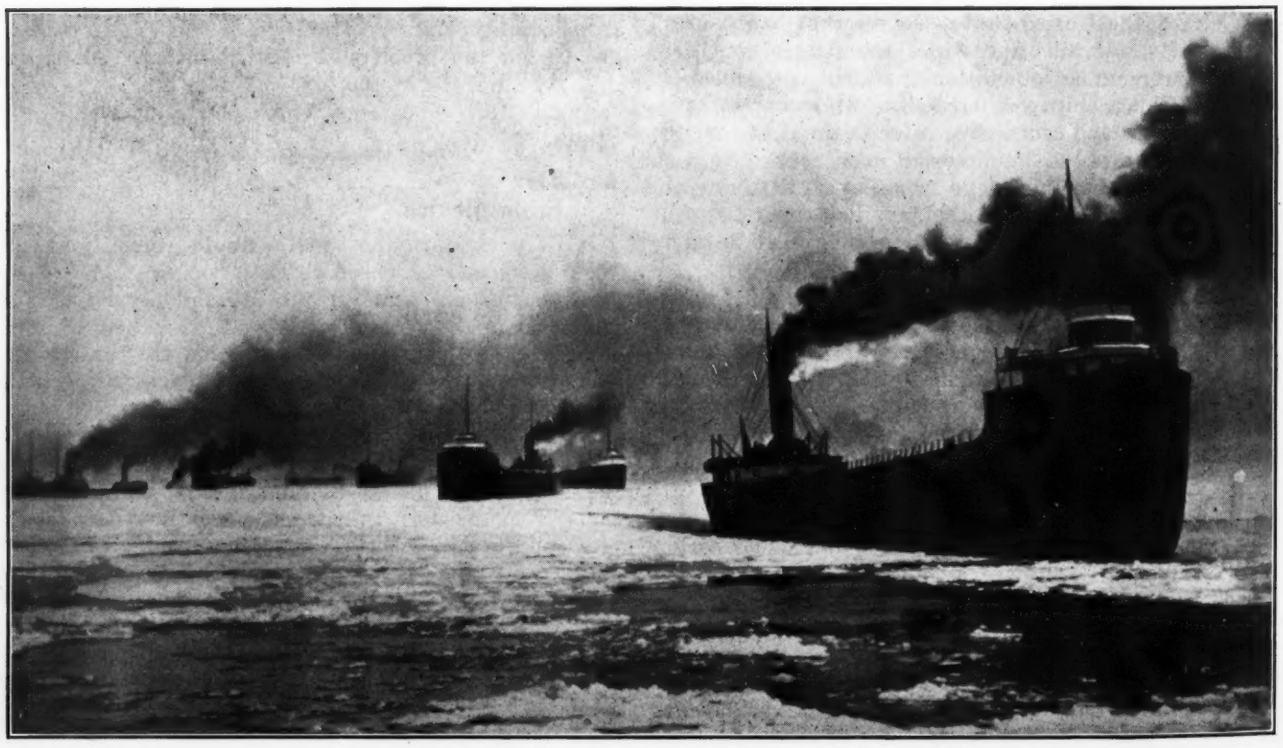
PILING TIMBER NEAR TRACKS IS ADJUDGED BAD PRACTICE IN MINES

Although timber piled alongside of the track in haulageways may clear the train, the vibration caused by passing loads will often cause the pile to slip and slide toward the track, so that the train will strike it.—Courtesy of the *Anode*, June, 1919.

Photographs From the Field

FLEET OF ORE VESSELS IN ICE BLOCKADE, DULUTH HARBOR, MINN.

From Bulletin No. 7, Bureau of Safety, Sanitation and Welfare, United States Steel Corporation.



Mining in the Belgian Congo

Production During 1915 to 1918—Growing Importance of the Region—Output Principally Copper, but Gold, Tin, Diamonds, and Coal Are Produced—Transportation Facilities Inadequate, but Are Now Being Developed

BY SYDNEY H. BALL* AND MILLARD K. SHALER†

MANY years ago, a pessimist asked Leopold, King of the Belgians, man of affairs and colony founder: "What will become of the Congo if the synthesis of rubber is discovered?" He replied: "One should not worry. The Congo has had its ivory period; it now has its rubber period. Tomorrow it will have that of its mineral wealth; eventually that of agricultural products." The "tomorrow" arrived during the period of the war, thirty-two years after the founding of the Congo Free States and nine years after the annexation of the colony by Belgium.

It is natural to expect that the economic life of European colonial possessions in Africa sustained a marked setback during the war. That the mining industry of the Belgian Congo weathered the stormy period satisfactorily is shown by the following annual gross value of its mineral production:

TABLE I. VALUE OF BELGIAN CONGO MINERAL PRODUCTION, 1913-1918

1913	$3,000,000	1916	$13,107,000
1914	3,850,000	1917	18,232,000
1915	7,420,000	1918	14,110,000

The Katanga copper accounts for about three-fourths of the production; the gold produced is worth about double that of the diamonds. The gold and diamond production has increased steadily during the period under consideration, although the increase in diamonds has been relatively more rapid. The copper production increased notably until 1918, when a shortage of native labor and of coke and other supplies, as well as of freight cars, together with an acute influenza epidemic, cut down the output. As to the future, no great increase is to be expected for a year or two years, after which time, however, a largely increased mineral output can be looked for confidently. At present the Belgian Congo's yearly mineral production is about half that of Alaska. The betterment in the financial status of the colony is indicated by the fact that the colonial deficit of $4,000,000 in 1913 had decreased to $1,400,000 in 1918.

The Great War naturally did not stimulate mining, and in reality was responsible for many vexatious and costly delays in the receipt of supplies, and the conditions created by the abnormal situation resulted in operation with insufficient white staffs and native labor, and in delays in programs of expansion. The most serious effect of the war, namely, restriction of investments in much-needed means of transportation, may only be fully realized later.

Although perhaps scarcely in place here, a few words upon the warfare waged in Central Africa will serve to remind the American reader that the war was bitterly fought, not only in Europe and Asia but in Central Africa as well. When the war broke out, the Belgian Colonial Government held that the Berlin treaty of 1885, entitled "General Act Relating to Civilization in Africa," prohibiting warfare in the Congo Basin, should be enforced. Germany, however, on Aug. 22, 1914, attacked Lukuga, and the Belgian Congo was forced into the war. About 20,000 troops were mobilized and took part in campaigns in Rhodesia, British East Africa, German East Africa, and the Cameroons. The most important campaign in which Belgian Congo troops were engaged was that in the former German colony of East Africa. Native Congo troops, officered by whites, conquered all of the northwestern part of that colony. As a result, a Belgian now administers, from Tabora, a territory, once German, of about 77,000 square miles, or six times the area of the Belgian homeland. By Dec. 1, 1917, practically the last German had been cleared from East Africa. With the previously lost colonies of Togoland, the Cameroons, and German Southwest Africa, the German flag disappeared from over 930,000 square miles of African territory.

Counterbalancing in part the ill effects of the war in Central Africa are certain advantages, which may be enumerated as follows: (1) the war demonstrated the practicability of the use of airplanes in the tropics; they will undoubtedly be used there for commercial purposes. (2) Some of the 700 miles of telegraph laid, the roads made and wireless installed are of permanent value. (3) The greatest benefit will doubtless be the reluctance of many soldiers—formerly city dwellers—to return to city life, and the consequent gain to the Belgian Congo of many virile and intelligent colonists.

That the Peace Conference is not apparently to add to the Belgian Congo that part of German East Africa conquered by the Belgian Congo troops seems unfortunate. This appears to be the most highly mineralized part of the former Teuton colony. With the defeat of Germany in Europe, the fear that the Belgian Congo might form part of a German "Mittel-Afrika" passed. Great Britain and France had as early as September, 1914, assured to the Belgian Government the integrity of the Belgian Congo, and on April 29, 1916, this engagement was not only repeated by France and Great Britain, but the foreign offices of Italy, Japan, and Russia joined them, promising, in addition, a special indemnity for the losses suffered by the colony.

Germany's desire for the Belgian Congo, as a step toward her ambition to found a vast "Mittel-Afrika," dates back at least twenty years. "Mittel-Afrika" was to include, besides Germany's old colonies, the Belgian Congo, Angola, the north half of Portuguese East Africa, Rhodesia north of the Zambesi, and all Africa south of the Sahara, to say nothing of the Azores, Madeira, Cape Verde Islands, Prince's Island, St. Thomas, and Zanzibar. Even more generous was the German who made the map captured by the South Africans at Windhoek, then capital of German Southwest Africa, which showed all of Africa German, except the Orange Free State and Southern Transvaal (the Rand was German), which were marked "Boer Reserves"! Here she was to obtain raw tropical prod-

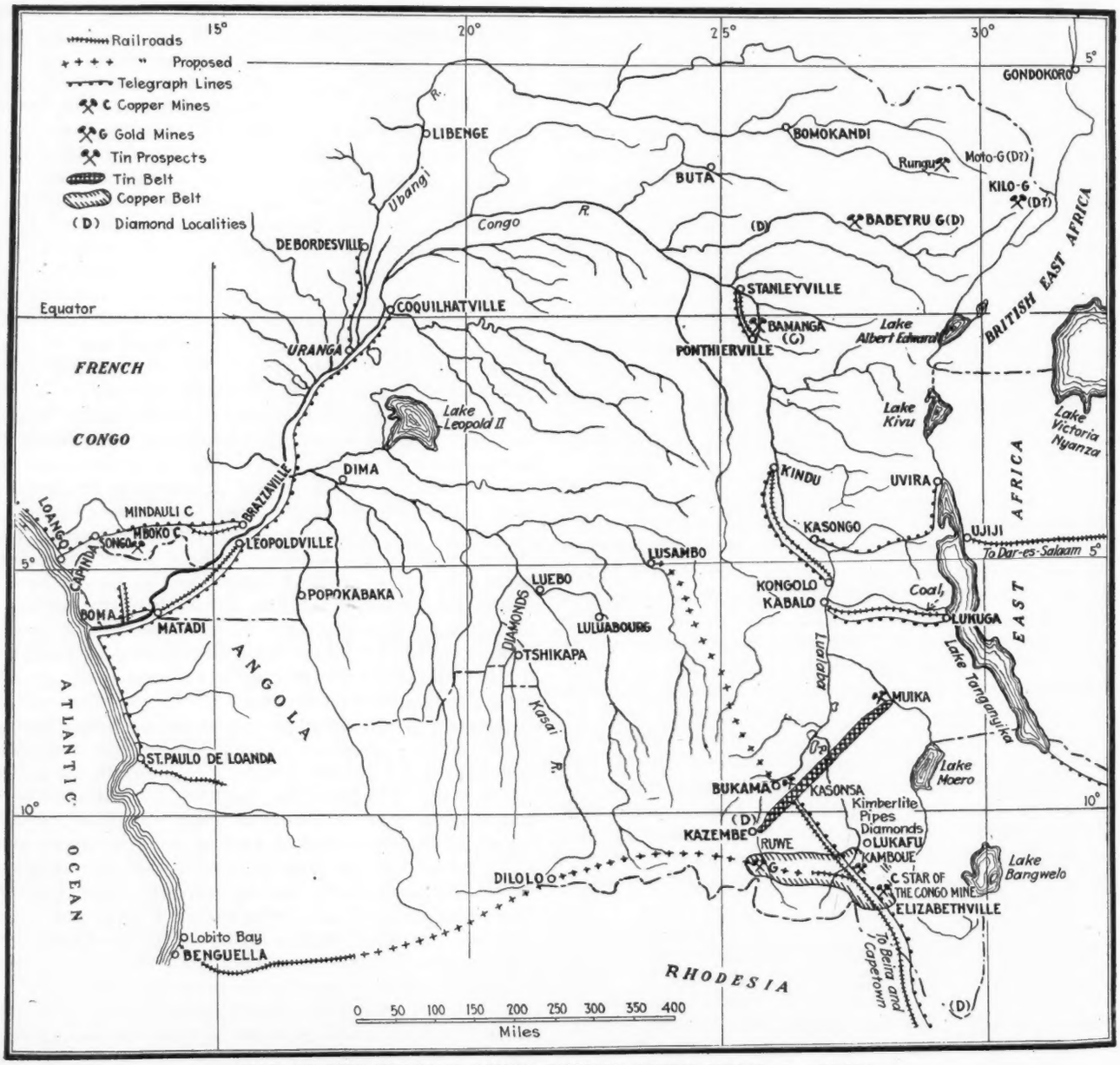
*Mining geologist, Rogers, Mayer & Ball, 42 Broadway, New York City.
†Mining engineer, 5 Montague du Parc, Brussels, Belgium.

ucts, here she was to train millions of black soldiers for a future war, and from Africa harbors she was to strike at the trade of Africa, India, Australia, and South America.

One of the mildest indictments against Germany's colonization methods, so far as the natives are concerned, is to quote the statement made in 1888 by the German East African Company: "The aim of colonization is to enrich without scruple and with decision our own people at the expense of people more feeble."

its tributaries, non-navigable stretches being paralleled by railroads. In all, there are within the colony over 9,000 miles of rivers navigable to steamers of light draft. More than 100 steamers, of which about one-half are the property of the state, ply upon these waters. The service on the whole is slow and costly, the chief necessity being larger and more modern river steamers, although river improvements are required locally.

There are within the colony about 1,020 miles of



MAP OF THE BELGIAN CONGO REGION, SOUTH CENTRAL AFRICA

The Belgian Congo has an area of 908,000 square miles. It has a population variously estimated at from 9,000,000 to 15,000,000, the true figure probably being about 10,000,000. The white population in 1916 was 5,364, of whom over 10 per cent were engaged in mining. The colony, in normal times, is linked with Europe by an adequate steamer service, but U-boat depredations and more pressing need of shipping elsewhere made the service distinctly unsatisfactory in 1917 and 1918. It is hoped that this shipping shortage will soon be remedied. Interior transport follows the Congo and railroad, or about four times the Alaskan railroad mileage. During the war railroad building was delayed, but the links between the Congo River (Kabalo) and Lake Tanganyika (Albertville) and between Elizabethville and Bukama were finished. The trip by rail and water from the Congo mouth to Elizabethville now takes about six weeks of actual travel, as opposed to an equal number of months ten years ago. Further, the first-named link completed an all-steamer-train trans-African route between Matadi and Dar-es-Salaam. From Ujiji to Dar-es-Salaam about 600 miles of railroad, once Ger-

man, is now operated by the Belgians. The Elizabethville-Bukama railroad similarly completes the Matadi-to-Capetown route.

Present transportation facilities are good in comparison with many colonies, but are unsatisfactory provided products less valuable than copper, gold, and diamonds are to be exported in quantity. Betterment of the Lower Congo-Katanga railroad around Livingstone Falls is imperative, as is also the construction of the Lower Congo-Katanga railroad which will not only connect the Katanga copper belt with a Congo seaport, but also pass through a country rich in minerals and forest products. Further, auto routes or other feeders to the principal railroads are essential.

The Benguella railroad, in Portuguese Angola, with the Katanga copper belt as its objective, is completed for a distance of 325 miles and has been graded for a further 75 miles. Construction was stopped during the war. A motor road exists from Buta to Bambili, and that from Aba to Rejaf (130 miles) is presumably completed. There is a wagon road between Stanleyville and Kilo. The length of these and other auto roads, about 650 miles, must be increased many times properly to serve as feeders for the present railroads and steamer routes.

A direct cable links the colony with Ostend, Belgium, and in the colony an excellent wireless service has been installed. There are also about 1,660 miles of telegraph lines. The pipe line from Ango Ango, near Matadi, to Kinchasa, near Leopoldville, furnished fuel oil for the river steamers until it was impossible to get deliveries of oil from Europe. Prior to the war, two hydroplanes were sent to the colony, and it is probable that in the future these and others may eventually find a certain use in carrying passengers, mails, and light express. The rivers are excellent landing places, and in addition a landing ground for airplanes has been established at M'Toa, on Lake Tanganyika. The Banque du Congo Belge, the colonial bank of issue, had seventeen branches last spring and eight more were to be established.

The Union Minière du Haut Katanga is expanding operations in its copper belt, in the southeast portion of the Belgian Congo, which contains many large high-grade mines. The publication of digests of yearly reports of the Tanganyika Concession Co. (which owns a little less than 40 per cent of the stock of the operating company) in the mining journals the last three years renders details unnecessary here.

The production of copper in metric tons by the Union Minière is given in Table II.

TABLE II. COPPER PRODUCTION OF THE UNION MINIÈRE

	Matte	Matte and Black Copper		Matte	Matte and Black Copper
1911	....	997	1915	300	14,054
1912	88	2492	1916	562	22,149
1913	162	7407	1917	1021	27,463
1914	299	10,772	1918	(a) 1000	(a) 19,000

(a) Approximate.

As before mentioned, the decrease in output in 1918 was due to transportation difficulties and labor shortage, and to an unusually severe influenza epidemic. In 1917 and 1918 only sixteen companies were large copper producers. The staff, including a number of Americans in the more important of positions, consisted in 1915 of about 250 whites, and in 1918 of approximately 450. A profit-sharing system, based on tonnage handled, is in operation among the white employees. The black laborers for the same years numbered respectively 3,500 and 7,000. During the war the Star of the Congo and the Kambove mines continued to furnish practically all of the ore, the Kambove mine being by far the larger producer in 1916-17-18. The Luishia mine and the Likasi produced a small amount, and the Chituru mine is now connected with the railroad and is being opened up. The Chituru and Likasi mines are on the railroad twenty-five miles from Elizabethville.

The quantity of ore in the belt, which is about 200 miles long, is unknown, but it is probably great. P. K. Horner, in May, 1916, estimated that there were positively developed at the Kambove and Star of Congo mines ore containing 304,000 tons of copper, and, in addition, "probable ore" containing 376,000 tons of copper (H. Foster Bain, *Mining Magazine*, March, 1917, p. 145). Such figures are sufficient to indicate that this is a most important copper region, as these are but two of the more important deposits. An extensive diamond-drilling campaign was carried on in 1915 and 1916. In 1916 and 1918 from 20,000 to 22,000 tons of ore per month was mined and treated.

The siliceous oxidized-copper ore requires much limestone and iron-ore flux and is smelted in blast furnaces to a black copper, containing 96 to 97 per cent copper. At the end of 1914 three furnaces were in operation, and two were completed in 1916. Nos. 6 and 7 were blown in in 1918. The daily capacity of these seven furnaces should be about 1,000 tons of ore, or 30,000 to 40,000 tons of copper per year. For various reasons only two to three of these furnaces were in operation during the last few months of 1918.

Experiments carried on at Elizabethville in concentrating and leaching in 1915-16 evidently were favorable to the latter process. A. E. Wheeler has now planned a large leaching plant, for which bids are being received. The plant is to have a capacity of about 55,000 tons of copper per year, and is to be operated by electricity generated by a 60,000-hp. hydro-electric power plant. As practically all the ores are oxidized, sulphide ores or sulphuric acid must be brought in from South Africa.

Costs, as given in the annual reports, do not include debenture or amortization charges. In 1914, mining, smelting, freight, and marketing cost about 10c. per lb.; in 1915, 9c.; in 1916, 8.41c. in the new furnaces and 9.51c. in the old furnaces, and in 1917, 11.8c. In 1918, owing to war conditions, the costs were 13.4c. In 1916, an average of 22.1c. per lb. was received for the copper and in 1917, 25.3c. Prior to the war, the copper was sold in Germany, but since then it has been shipped to England, although at least one small shipment reached the United States.

The Belgian Congo produced, to the end of 1918, from its gold placers, about $14,600,000. Recent exports of gold from the colony follow:

TABLE III. BELGIAN CONGO GOLD PRODUCTION 1911-1916

	Kilos		Kilos
1911	908	1914	930
1912	967	1915 (a)	3,935
1913	1,476	1916	2,852

(a) Owing to war conditions, the greater part of 1914 output was exported in 1915.

Most of this gold is carried by porters from the placers, which are in the northeast part of the colony, to the Uganda railroad, and thence shipped to Europe via Mombasa. In 1918 the gold, however, was shipped via Elizabethville and the Cape-to-Cairo railroad. Recent productions have been as follows: 1915, $1,667,700;

1916, $1,944,000 (3,240.212 kg.); 1917, $2,215,500 (3,692.551 kg.); 1918, $2,308,100 (3,846.786 kg.).

The colony operates the two more important gold placers—Kilo and Moto. Until 1918, these placers were operated by a single management, but in that year the mines were placed under separate managements. From 8,000 to 10,000 negroes are employed. Kilo, early in 1915, was seriously hampered by a shortage of white staffs, and in 1918 by a meningitis epidemic. In 1915 it produced 1,623.259 kg.; in 1916, 1,637.651 kg.; in 1917, 1,793.159 kg., and in 1918 about 2,213 kg. In 1916 it was stated that 14,000 kg. of gold was contained in reserves, so that the placer presumably has a life of three years at the present rate of production. In 1915 approximately forty sluices were in operation. Costs are reported to be about $1.25 per cu.yd.

The Moto placer produced in 1915 a total of 999.519 kg. of gold; in 1916, 1,360.561 kg.; in 1917, 1,759.352 kg.; and in 1918 about 1,503 kg. The Babeyru placer, operated by the Société Internationale Forestière et Minière du Congo, in 1915 produced 164.306 kg.; in 1916, 241.914 kg.; in 1917, 137.609 kg., and in 1918, about 130 kg. In 1918 it was worked out. Costs were from 85 to 90c. per cu.yd. In the same general region several new gold prospects are reported, but none of these appears to be important. The Geomines has done nothing with its gold placers in the Katanga region.

Diamond Production

The Kasai diamond field, owned by the Société Internationale Forestière et Minière du Congo, had produced to the end of 1918 somewhat over 400,000 carats of diamonds. Recent productions follow:

TABLE IV. BELGIAN CONGO DIAMOND OUTPUT, 1915-1918

	Carats		Carats
1915	48,935	1917	100,000
1916	53,940	1918	164,200

Thirty white men and about 3,800 blacks are employed. The Kasai company has found a number of diamondiferous areas to the northeast of the Forminière's ground, and the Lower Congo-Katanga R. R. Co. has made discoveries still further northeast. The Kundelungu Exploitation Co., which owns a number of slightly diamondiferous kimberlite pipes in the Katanga region, has done no work since the war began. In the same region the Simkat, which owns about seventeen pipes, carried on rather extensive washing tests. Diamonds occur in at least certain of the pipes, although none are exploitable. Scattered diamonds continue to be picked from the placer sluices in the northeastern part of the Belgian Congo.

Tin Production

The Geomines is exploiting its tin placer at Kiambi by monitors and sluices. About ten white men and from 500 to 600 blacks are employed. It is understood that approximately $4,000,000 worth of gravel of low grade (from 1/10 to 1/100 per cent) has been blocked out. In 1917, approximately 300 tons of concentrate containing about 50 per cent metallic tin was produced. Its other tin placer at Naulonga-Kikondja is not being worked.

The Union Minière du Haut Katanga has done little at Busango since the war began. In 1917 the railroad reached a point within thirty-eight miles of the mine, and exploitation on a small scale was resumed. The Simkat, it is understood, is to again begin exploitation at Muika in the near future.

The Geomines has been opening up coal at Kilometer 262, on the Kabalo-Lukuga railroad. The company has sunk 40 m., cutting four seams of coal from 1.2 to 1.8 m. (4 to 6 ft.) thick, and it has drifted 100 m. on the best seam. This coal field has been described in detail by P. Fourmarier.[1] The coal occurs in a series of rocks of Karoo age, which are also coal bearing in South Africa. The principal coal outcrops are in the Valley of Nikuha and Kaseke creeks, and also at Kakuiga. The beds vary from horizontal to almost vertical. There are five coal seams, the most important in places being almost six feet thick. The weathered coal contains 61.9 per cent of carbon and 13.25 per cent ash and produces 5,891 B.t.u. It clinkers badly, but doubtless can be used locally on the railroad.

General prospecting, particularly in the Katanga, has been greatly curtailed by the war. The Kasai company has had men prospecting for gold in the northeast part of the colony, without, however, marked success. The various parties sent out by the Grand Lakes railroad into the country to the west and northwest of the northern part of Lake Tanganyika have all returned. A small gold placer, probably not exploitable, was located, and gem corundum deposits are said to have been found about 200 miles northeast of Kasongo. The rubies of these placer deposits are, however, small and the larger sapphires are off-color.

The law of Jan. 21, 1915, permits areas exploited for precious metals and precious stones to be closed to protect the products from theft. In the Katanga, because of the war, the period of legality of both general prospecting and mining permits has been extended. The period of validity of prospecting concessions in other parts of the colony will presumably also be extended.

Orebodies in Northwestern East Africa

That part of East Africa conquered by the Belgians and now administered by them is the best mineralized part of the former colony of German East Africa. It is a gold region of considerable importance, and a number of promising gold prospects are known. The Sekenke mine, owned by the Kironda Goldminengesellschaft, is the most important producer. The mine, opened in 1906, produced from 1909 to 1913 gold to the value of about $642,000. Iron, copper and other metals and non-metals of value occur within the area.

Immediately north of the Belgian Congo border, near the Atlantic Ocean, is the M'Boko Songo-Mindouli copper belt, in the French Congo. A small amount of rich ore, said to contain 45 per cent copper, is shipped annually from the Mindouli mine to France. Ore shipments have been as follows:

TABLE V. FRENCH CONGO COPPER-ORE SHIPMENTS, 1913-1916

	Tons		Tons
1913	1,271	1915	463
1914	1,451	1916	600

The decrease in production in 1915 and 1916 was due to transportation difficulties, all ore being shipped over a light railroad to Brazzaville, thence by boat across Stanley Pool, and from there to the coast by the Lower Congo railroad. With proper transportation, the output could be considerably increased, but scarcely tenfold, as some French engineers claim.

[1] "Annales de la Soc. Geol. de Belgique"; Pub. Rel. au Congo.

Pump Troubles

Repairs and Renewals—Slime and Tailings Pumps, and Plunger Pumps—Equipment and Tools Needed To Effect Replacements and Readjustments—Care and Conservation of Parts

BY CHARLES LABBE
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A PUMP is a simple machine when in good working order and operated under favorable conditions, and is one of the most reliable and important adjuncts to be found in mill or plant. To maintain the condition known as good working order requires a knowledge of the fundamental principles of operation and construction. Considerable study and foresight are required to maintain conditions under which pumps will run effectively. Many persons consider a pump too simple a device to justify much thought and attention, and the result is that considerable work will be required sooner or later if the pump is to be kept in effective condition. The smaller the pump the less attention will be given to it; and, as with many other things, so long as it runs, no care is thought needed. But the pump may not give any warning. It may run today and quit tomorrow. Whatever the trouble, it appears slight at first view, but it often takes a good deal of experience to remedy it.

If only clear water is handled, little difficulty may be expected, but in many mills and cyanide plants the pulp and tailings must be pumped. In pulp and tailings pumps there is much scouring, and operating difficulties are limited mostly to repairs and renewals of worn-out parts. With water and clear solution more mechanical troubles are experienced, because pumps handling these materials are more complicated and must fill two functions—suction and pressure. With slime pumps the function is principally pressure.

Even if the simplicity of a pump is generally known, it will not be out of place to go over the fundamental principles. Suction may mean vacuum, but vacuum will not raise water. Pressure is needed to force water up. This pressure, the atmospheric pressure, must be applied on the water to force it into the vacuum created by the pump. It is known that at sea level the atmospheric pressure will force water up 33.83 ft. into a vacuum. The best pump in the world will not suck water an inch higher. Theoretically and practically, the suction depends on the elevation above sea level, less the mechanical losses, and it must be remembered that no pump reaches for water, but water must come to the pump after the vacuum is created. Whatever the pump, plunger, centrifugal or rotary, the suction troubles are nearly the same, and under this head can be classified three-fourths of all difficulties encountered in the operation of pumps.

LOCATION OF PUMPS

A pump must be placed where sufficient room can be provided. Accessibility from all sides is of prime importance. It is difficult at best to correct pump troubles, without fighting for room in cramping positions. The foundation must be of ample size to prevent vibration, which would tend to loosen or break pipe joints. Light, natural or artificial, must be a little more than sufficient. Drainage must be provided for every circumstance, and the pump must be placed where it will be a pleasure to work on it. The pump must be as near water as possible, and the suction pipe must be as short and as straight as the place will permit. Avoid long suction pipes where a high vacuum must be maintained, as a small leak will cause much trouble. Avoid air traps. They have caused the failure of many a pump to start. If the pump is not already provided with flanged connections, it will save future troubles and time lost in repairs to put them in. To make the change, plain, straight flanges with bolts are the best. Unions are good, but in the larger sizes, from 2 in. up, they are unhandy. The pipe must be pushed back to join, the nut may start cross-threaded, and most of the piping and pipe lines can be moved sidewise, but hardly lengthwise. Reduce to the strictest minimum the number of fittings used. They are expensive in first cost and in running, on account of the friction they cause.

HORSEPOWER AND PIPE SIZES

The formula for horsepower necessary to raise water is very simple: *Weight of water in pounds* × *feet friction* = *hp.* ÷ *33,000.*

In every case friction is the hardest to ascertain. It varies with the size of the pipe and the number of elbows. In the following formula, *Gal. per minute* × *total lift* × *0.00034* = hp., the friction is included. The size of the suction pipe may have to be figured out. Remember that the velocity of 200 ft. per min. in the suction pipe gives the best results, from which the formula is obtainable: *Area of plunger* × *plunger speed in ft. per min.* = *area of suction pipe* ÷ *200.*

The size of the suction pipe is commonly the same as the flange connection. The principal reason why the suction pipe is larger than the discharge is because water must travel at a rate of 200 ft. per min. for the best results. Any extra friction lowers the efficiency of the pump considerably; whereas, in the discharge pipe, a speed of 350 ft. per min. is most satisfactory. The water moves faster and a smaller pipe is sufficient.

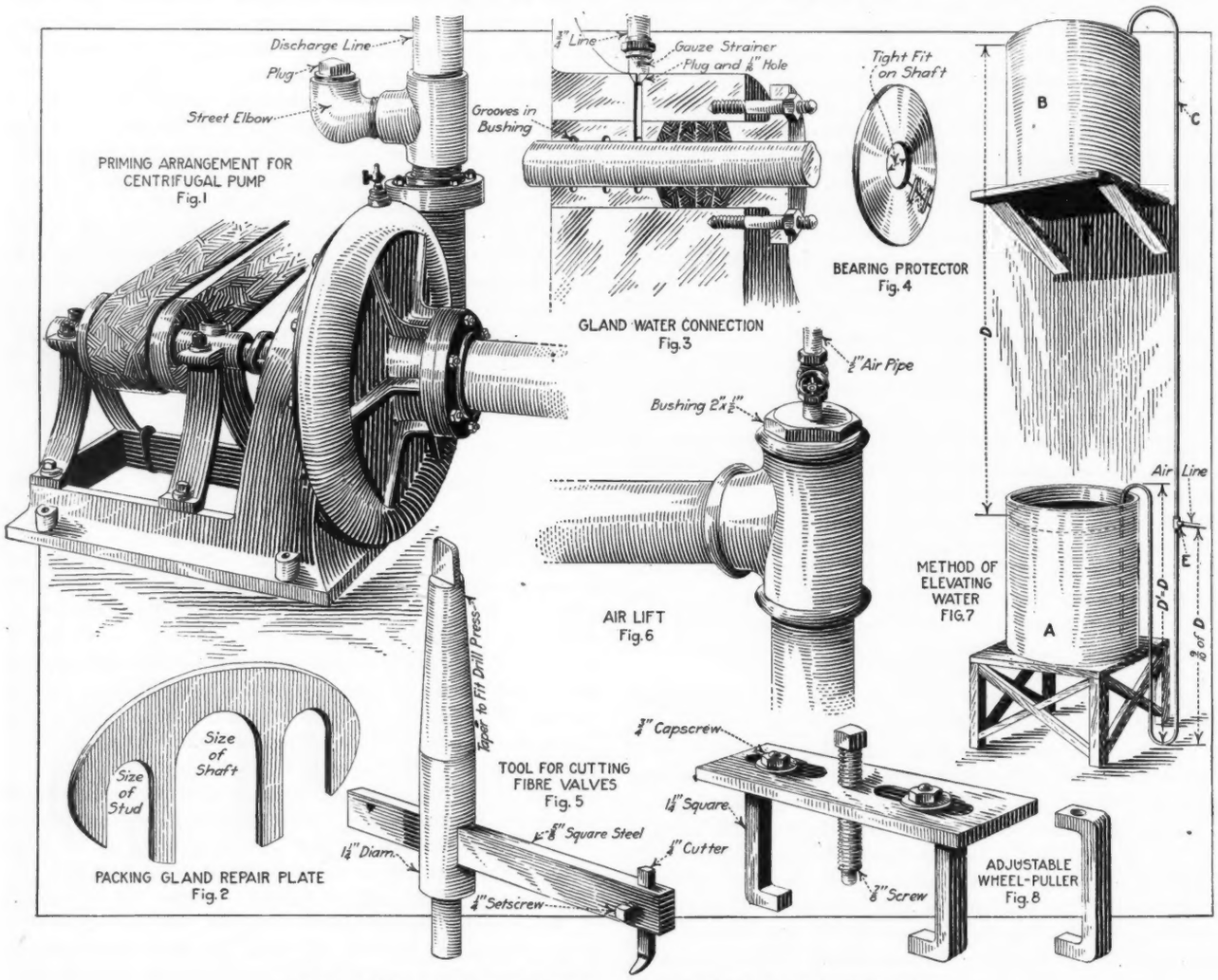
CENTRIFUGAL PUMP TROUBLES

Trouble can often be avoided by making a thorough inspection at regular intervals, five times a year as a minimum, but this is seldom done, as few like to disturb a centrifugal pump so long as it is pumping well. A slight change in conditions will stop the pumping, and trouble will come at the most unexpected moment. Nearly all centrifugal pumps taking water from below the level of the pump, if stopped and started often, must have a foot valve. All pumps with double suction runner make good vacuum, but most pumps with a one-sided runner do not. The operator may learn when a pump needs a foot valve, by holding his hand (if this can be done) at or near the end of the suction pipe. He can feel the water go into the pipe a foot or so,

and then come back. This may happen about twenty times a minute. A vacuum gage on the suction line will show the same thing—a vacuum of an inch or so, then back to zero.

All centrifugal pumps must be primed before starting. The intake pipe and the pump must be filled with water. There are many ways of priming pumps, the simplest being with bucket and funnel, but any other way is as reliable. It is advisable, to facilitate priming, and to help in finding the cause of later troubles, to put at the discharge a *T* with a street *L* and plug (Fig. 1.) By taking the plug off, one can pour water into the pump or connect priming water from an independent line. Large pumps are primed with a steam ejector or a water ejector. Whichever way the pump is primed, the water must come to a point above the pump to avoid air pockets. Many a time small centrifugals have been started by holding the intake pipe level with the top of the pump, filling it with water, starting the pump, and at the same time dropping the pipe in the water. This may do with a small pump, with temperature above 32 deg., and if not attempted too many times, but a leak will soon occur in the suction line, which will prove annoying.

The packing gland must be tight, but not so as to make the shaft heat and burn the packing. The packing must be renewed when it has lost its elasticity. Do not wait until it gets as hard as wood, or trouble will be experienced. When renewing it, be sure to take all the old packing out and at the same time notice the condition of the shaft. If badly worn or rough, or out of center of the gland, do not expect the best packing to last. Square flax packing of the exact size of the stuffing box must be used. Most of the square packing will stand slight hammering (up to $\frac{1}{8}$ in. out of size) to make a good fit. Rubber packing does not give satisfactory service in the stuffing boxes of centrifugals. There is not enough room for the elasticity of rubber to act, and it soon burns if in contact with the shaft. Always use plenty of flake graphite and oil when packing pumps.



MECHANICAL KINKS IN PUMP INSTALLATION AND OPERATION

Do not coil packing in one piece until it fills the stuffing box, and then cut the end off. The best way is to cut rings that will fit the shaft exactly. Place one ring in at a time, pushing it squarely into the stuffing box with the packing gland. See that the joint of the next ring is opposite the one just put in. Mark on a convenient place the exact size and length of packing it takes to make a ring, so that it will be an easy matter to make another good-fitting ring when needed. If in packing the pump the shaft is not in the center of the stuffing box, it is probable that the bearings are worn, and consequently it will be hard to make the packing hold, as one side is too loose and the other too tight.

Unusual wear of the shaft may be caused by the belt being too tight or the motor out of line. Either con-

dition will cause the bearings to heat, but if the shaft vibrates, and the wear is all on one side, the runner is out of balance. Fill the stuffing box nearly full with packing, but do not screw up the nuts on the gland too tight. Do not tighten the nut on one side more than on the other, or the gland will break or be cramped and score the shaft. The purpose of the packing gland is to prevent leakage, so keep it just tight enough. Any extra tightening will only increase friction and cause the shaft to heat. Sometimes, on account of chemicals in water, the oil or grease in the packing does not last, and in a short time the packing is lifeless. Under such conditions, before putting the packing in next time soak it in a mixture of white lead and graphite.

Repairing Glands

Whatever may cause a packing gland to break, the commonest repair is to fit a plate of stout sheet iron to slip over studs and shaft (Fig. 2) without taking anything apart. Such a plate may be kept on hand.

Broken studs are more troublesome. To hold the gland a bolt and nut can be so set that the end of the threaded part goes into the hole of the gland with the head against the closest part of the pump (as nearly in line as possible), and the adjustments made with the nut. Later on, the broken part will have to be drilled out and a new stud made. If the stud has stripped the thread in the casting, the hole must be tapped out to the next larger size, but sometimes the next larger size cannot be used. Then the hole must be tapped with the nearest pipe tap, and one end of the new stud must have the same pipe thread. Never replace a stud by a capscrew, because if the screw is taken out often it soon wears the threads off the casting, and before long the hole will have to be tapped out for a larger size.

Troubles in Running

If, when the pump is properly primed and started, the water does not come in quantity "as it used to," it is possible that the impeller is worn. The speed may be increased. If the priming is lost after the pump has started, there is probably a leak in the suction, or the packing is loose. From 5 to 10 drops of water per minute dripping off the gland lubricates the packing and helps to keep it soft and airtight, but more is not advisable.

If the shaft goes back and forth, the pump needs priming. There is air in the intake line, or possibly the runner is off the shaft or the shaft itself may be broken. Should the pump pull hard and overload the motor, the runner will be found to be rubbing against the casing on the suction side. Either the balancing device is broken or the thrust collar has moved on the shaft.

After running a while the casing of a centrifugal pump may get hot, sometimes nearly to the temperature of boiling water. This is a sure sign that the pump is not working. The runner keeps on churning the same water. Probably nothing is coming to the pump. A valve on the intake line may be closed or the pipe clogged. The pump casing will heat and the packing gland will leak badly, and tightening will not improve matters. In case of the pump casing heating, a pressure gage will prove useful. Connect it to the pump casing. If there is excess pressure the discharge line is closed, but if the pressure is a few pounds, or lacking, the trouble is with the intake.

Sand pumps are made only in the centrifugal, volute, and turbine types. All are made with renewable liners and impellers, to allow for wear. To keep the sand off the bearing and packing gland, water of higher pressure than that generated by the pump is introduced on the bearing side. In action and construction they are all centrifugal pumps, and subject to the same operating difficulties.

On account of the weight of the material to be pumped, the slime pump does not work well on suction. In nearly every case the pump must be set below the supply. The pulp must come to the pump. The only exception is the dredging pump, in which the impact of the water carries the gravel, but this is not a slime pump proper. The intake line must be as straight as possible. Elbows here are out of place, on account of foreign matter—wood, rags, and like substances present in pulp—which usually stop at the elbow and finally clog the pipe, and also on account of the friction, which soon wears a hole through the elbow.

Gland Water

The gland water must come from an unfailing supply, and the pressure must be at least a pound for every foot of pulp elevation. The best practice is to have a special tank of clear water (or clear barren solution, if the lime percentage is not high) placed in the highest part of the plant. To get the benefit at the gland, of the true pressure, the water is brought in a $\frac{3}{4}$-in. or $\frac{1}{2}$-in. pipe, and the last nipple on the pump is reduced to $\frac{1}{16}$ in. by plugging the nipple and drilling a hole (Fig. 3).

There will be no chance of clogging if, in the union just before this nipple, a metallic gauze screen of conical shape has been placed. Inspection will be an easy matter. In some pumps the gland water is connected to a loose gland-water ring, which is placed about the middle of the stuffing box when packing the pump; but the best practice is to connect the water to the bearing close to the packing. If grooves have been provided, connected together, the bearings last longer. If the gland water stops, shut down the pump at once, as if allowed to run the sand will enter between the shaft and bearing, and in a few minutes the shaft bearing, packing, and gland may be worn so as to make their renewal imperative.

To protect the next bearing from water or even from pulp, on the shaft, next to the packing gland, put a washer made of 4- or 6-ply rubber belting about 3 to 6 in. in diameter, fitting tightly on the shaft. If not put on when putting the pump together, the washer may be put on afterward by making a cut into one side and tightening it with wire (Fig. 4). The washer will revolve with the shaft, and any leakage will be thrown out sidewise, instead of following the shaft.

Pressure gages used on tailings pumps must be protected by a siphon having at least two coils; and before being put in operation must be filled with water. They are used only for a few minutes at a time, because if left in circuit with the pump the pulp will soon take the place of the water and the gage will be filled tight and rendered useless.

The material used in pump liners is usually chilled iron and manganese steel. Impellers are made of the same substances. The open runner may not be as efficient as the closed type, but the preference is decidedly in favor of the former. When the liners are worn

down to a safe limit they must be replaced, as, if they wear through, the outer shell, being soft, will not last long.

In replacing liners, the ground parts must join exactly without gaskets. After the casing bolts have been tightened, the setscrews holding the liners in place are made fast. Even if the ground joints of the liners are as good as can be made, some pump men take the extra precaution of pouring cement (one part cement and two parts sand) between shell and liner to avoid eddies or leaks, as eddies will wear holes in the liners or through the shell.

Liners must be handled with some care, as they break easily, and repair on them is out of the question. They are so hard that they cannot be drilled. Holes have been filled and small runners rebuilt, but their brittle character prevents large repairs from being successful.

In setting the thrust bearing of the runner shaft, bring it against the liner on the suction side; then bring the shaft back ⅛ in. This is a safe margin, because when the pump runs, the force of the suction will bring the impeller a trifle closer still.

Multi-stage slime pumps have not been used extensively, for the reason that a sand pump must be as simple as possible. Two-stage or compound pumps are often made with two centrifugal pumps of the same size in series (one right hand, one left hand), the outlet of the first one being through a number of elbows discharging in the intake of the second pump, and both driven by a common shaft with pulley or motor in the center. Such an arrangement is common, but is of low efficiency. The principle of the series pump is to have the water delivered to the next one, with pressure but no speed. Two things that are positively worthless on a slime pump are foot valves and globe valves. The best valves are those of the quick-opening gate type.

In direct-connected pumps, flexible couplings are always used, and much wear takes place in them. They are made in many styles, the multiple-leather links being about the best. Rubber wears out too quickly. Iron to iron wears also surprisingly fast and is noisy. When iron to iron is used on the studs or bolts, I slip on a lead bushing about ¼ in. thick. To make the bushings as needed pour a bushing about 12 in. long and saw off required lengths. A supply can be kept on hand, and, when necessary, old ones may be replaced. Their cost is slight. They are noiseless, and do not wear into the flanges.

In making the regular pump inspection see that the pump shaft is in line with that of the driver. This may be done by putting a straight-edge on the coupling flanges, trying in two or three places, making sure, also, that the foundation and base bolts are tight. Never run a pump without water, as damage may result. All parts have but little clearance and will bind and heat. Do not use a check valve on the discharge line of a slime pump, as when the pump is stopped all the sand or slime will settle on top of the valve.

Single- or double-acting plunger pumps have a piston or plunger made either entirely of metal or with leather cups. The suction and discharge valves are part of the pump. The troubles of suction are the same in all pumps, but as these pumps have valves to hold the water they are somewhat more complicated than centrifugals, though they have a greater centrifugal. Having more working parts, they require more attention. They must be inspected regularly, the valves at least once a month. The packing, being placed around the plunger, requires a larger quantity, having also to hold the water from passing outside.

Valves on Pumps

Valves are one of the main wearing parts of a pump. In handling clear water they are expected to last well, but with any grit in the water, valves and valve seats will not last long. They must be replaced and the seat refaced. Under normal conditions the iron valve seat and the hard-rubber valve are the most economical and give the best service. They form an ideal combination for the cyanide plant, where brass is out of place. Red fiber also gives good service and is to be recommended where odd sizes are used. Fiber valves can be cut on the drill press as well as on the lathe. They are traced on the sheet, the stud holes drilled first, and the outside cut to size with the tool shown in Fig. 5. The valve seats are faced on the lathe. Often the grooves worn in the seats are rebuilt with the oxyweld, and then either dressed on the smooth side of the emery wheel or turned down. In out-of-the-way places, where supplies do not always come when expected, flat valves made of pieces of boiler plate have given surprisingly good service. They were made of the same thickness as the original rubber valves. When slightly worn, they were turned over and later refaced on the lathe. No springs were used in connection with them, and they did not wear any harder on the studs than either the hard rubber or the fiber.

Valve seats are removed by unscrewing them from the pump, or, if driven, by pulling them out with the wheel puller. Studs wear mostly on one side and must be replaced when in bad order. New studs must not have over ¼ in. clearance between the end and the plate cover, so that if the stud works loose it cannot fail. The yoke holding the valve cover must be made of cast iron, and must not be replaced by a solid bar of iron or steel. It works as a safety in case the pump be started against a closed valve in the discharge line, and its breaking releases the valve cover. The cost is moderate, and if anything else should break serious damage would result. To prevent breakage, a relief valve is installed on the by-pass line, but to be reliable it must always be kept in good condition and tried often.

Packing for Pumps

For the packing, the same conditions prevail as in the centrifugals. Each ring of packing must fit exactly, and the joints must be opposite or staggered. It is of little importance whether the ends are cut square or 45 degrees.

Plungers must be trued up when grooved, although the worst condition is when they are not parallel. After they have been turned down, it is good practice to put a turned ring of iron in the bottom of the packing box to make up for the difference in size and to prevent the packing from extending too far past the casting.

In packing plungers, an alternation of square flax and rubber fabric lasts longer than if packing is entirely of the same material. Use flake graphite freely, and about once a day oil the wearing surface of the plunger. When the service of a pump requires the packing to be changed every month, or more frequently, the flax packing can be used again by turning it over,

putting the inside worn face outside. Large packing glands which have stood much wear may be slightly bored out on the lathe and babbitted.

BEARINGS

Bearings must not be allowed to become loose, as the lost motion will crystallize the bolts, and they will snap off. A bad practice is to cut down bearing caps when the shims have all been taken out. When a bearing is worn out, a new one should be put in. Bad bearings and worn gears make noise and require more power. It is economy to make good permanent repairs.

AIR CHAMBERS

To take up the shocks and fluctuations of the plunger, and to form a steady flow, an air chamber is attached to the discharge pipe. It is usually made of cast iron, but can be made with a piece of pipe with a cap at one end. In some cases the action of the water, and also of cyanide solution, makes it porous, and in a day or two all the air will be out of the air chamber. The result is a steady pounding in the pipe. The air chamber must be taken out and treated, about once a year: dried, filled with paint and left under air pressure for about forty-eight hours. Some of the paint will fill the pores and leave a good coating inside, leaving the air chamber tight. Some air chambers are provided with a glass gage, but too often the glass is broken, or most of the air leaks out through the fittings, and as gages require much care they are not in high favor.

Pounding in a reciprocating pump may be due to the piston striking against casting, to loose bearing, unscrewed rod, air chamber full of water or discharge valve out of order. To find the cause, a good way is to follow the action of every plunger and notice exactly at what part of the stroke the pounding occurs. When running with a closed or nearly closed valve on the suction line, the pump runs light, and every bearing makes a noise from lost motion that is never heard when the pump is under load. The gears also are noisy.

Priming of a reciprocating pump is recommended, although not always necessary if the packing and valves are air-tight and the lift is not too high. If the pump takes air from any source, it is likely that it will pound, and operate as though all the plungers were striking regularly on something hard. The pump must be stopped and filled with water, after opening all vents to let the air out, and the leaks must be attended to.

A pressure gage connected to the discharge line of a pump will show whether the plungers are doing the same amount of work. In a triplex pump, the gage hand will show three even fluctuations per revolution. If one is weaker than the other, it either leaks at the packing or something is wrong with the intake valve. A valve may stick on the stud and stay open; the spring may be broken and may have worked in between the stud and the valve; the gage will show an irregular pulsation, and the valves must be inspected. By listening, a pump man can soon tell that something is wrong.

Sharp pounding in the pipe indicates that an air chamber is full of water, and the hand of the gage will work up and down quickly. An extra air chamber placed about half way in the line may help considerably. Insufficient water supply will cause a jerking of the plungers and a pound, indicating failure of the supply or that the intake valve or line is partly stopped. A plunger loose on the rod will produce the same effect. Too quick seating of the valves may cause a pound, or the springs may be too tight. In fast-running pumps, a pound may be heard in the intake line as the intake valves close too quickly, but this is of rare occurrence. The remedy is to put a vacuum chamber on the intake line close to the pump.

DIAPHRAGM PUMPS

In many mills diaphragm pumps are used as sump pumps for transferring pulp from one tank to another. They are simple in operation, but their range of work is limited. The rubber diaphragm acts as plunger with a valve which is part of it. There are no other adjustments but the stroke, which, when once set, is seldom changed. The repairs are mostly limited to the renewal of worn-out parts. The valve seats can be either rebuilt with the oxyweld or faced down on the shaper or on the emery wheel. Being only rough castings, they are discarded when worn down too far. Nearly all the troubles are caused by worn parts. The pulp may be so thick that the pump will not handle it, but the pump is not to blame. Diaphragm pumps must be primed before started, and often the diaphragm must be covered with water to make it airtight. When not in use the diaphragm is taken out, wrapped in paper, and stored in a cool place; otherwise it may be so dried out and cracked as to be worthless.

AIR LIFTS

Where compressed air is available, air lifts are the cheapest and most simple pumps; and they should be mentioned in any discussion of pumping practice. They may not be the most economical when crudely made. In most cases they are made only when needed, of fittings on hand. Fig. 6 shows a type which can be made in a short time with a 2-in. T, one reducing bushing, one length of 2-in. pipe, one ½-in. valve, one length of ½-in. pipe, a foot or so shorter than the 2-in. pipe, with about a dozen ⅛-in. holes drilled near the end. The one drawback is the depth of submergence that air lifts must have. The footpiece in rough-and-ready mill work is not important, small holes drilled around the bottom of the air pipe being the best. For a large and steady amount of water, specially designed and ready-made footpieces are used, and in many cases the costs for pumping are less than with any other kind of pump.

Solution in tank *A* (Fig. 7) is to be lifted to tank *B*, without cutting any holes in the tanks. The pipe *C* will be connected so as to form a siphon over the rim of tank *A* (priming valve on top of siphon) and extended down to a distance equal to *D*. The air pressure will be connected through a tee at *E*, a point nine-tenths of the distance *D* on the up pipe.

Dirty and gritty mill pulps cause pump trouble as a rule, and tanks should be made 5 or 10 ft. deeper in the first instance and an air lift used.

USEFUL TOOLS

Besides the usual set of tools and wrenches, the repair man must have one set of pipe wrenches, chain tongs for the large sizes, two small crowbars, with one end chisel-bit and the other round and pointed; three or four punches not over 12 in. long, the smallest size being ⅜ in. and the largest 1 in. They are specially useful when connecting large flanges. First, the round end of the crowbar is placed through two holes of the

flanges. This will hold the pipe line in place. Next the gasket is slipped in, one hole of the gasket facing any hole in the flange. There a punch is driven fairly tight, the crowbar taken out, the gasket holes brought into place, and the second punch is driven in any hole about opposite, thus bringing all the flange holes in their exact place. The bolts are then put in the other holes without the slightest trouble, whatever size the flanges may be, and, when well tightened, the two punches are hammered out and bolts put in their places.

Packing hooks are of all sizes. The most commonly used are made of $\frac{3}{16}$-in. steel wire, one end with a ring handle, the other end corkscrew. An adjustable wheel puller for replacing pinions and gears, pulling out bushings and valve seats—a strong one and easy to make—is shown in Fig. 8. A small automobile screw-jack which can be handled with one hand where crowbars cannot be used is likewise essential, as are also several chisels of different shapes for cutting gaskets, and a vacuum and a pressure gage for testing pumps. Scrapers made of old files for cleaning flanges and a fine wire brush for cleaning threads should be provided.

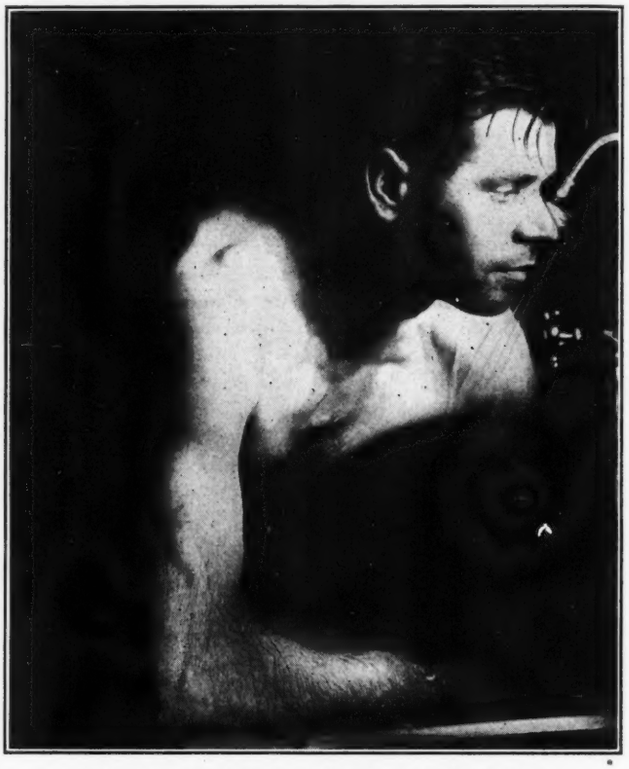
On pipe joints use a mixture of graphite and linseed oil. If in narrow places and high pressure there is trouble in holding gaskets, use soft sheet zinc about $\frac{1}{32}$ in. thick in one or two thicknesses. If taken out often, the zinc sheets must be annealed.

Advantage of Washing From a Flowing Stream

The illustrations show the application of the shower to the ordinary type of faucet for washing purposes

APPLICATION OF THE FLOWING STREAM

in change houses. This improved method of washing from a flowing stream permits a workman to perform his ablutions in a more thorough manner than is allowed by the usual method. The advantages are apparent, as the upper part of the body can be easily reached by the stream, much to the satisfaction of the workman. The sanitary feature of the installation is a distinct advantage, as the operation is claimed to be absolutely germless.



WASHING VARIOUS PARTS OF THE BODY

This installation is used by the United States Steel Corporation and the photographs are reproduced from Bulletin No. 7 of the Bureau of Safety, Sanitation and Welfare of that corporation.

Transvaal Gold Output

Output of gold at Transvaal mines during the first six months of 1919 amounted to 4,147,484 oz., valued at £17,617,391. This compares with 4,256,334 oz. in the same period of 1918. The following table shows the monthly figures for the last four years, in fine ounces:

	1919	1918	1917	1916
Jan.	676,059	714,182	782,634	787,467
Feb.	636,728	659,759	721,321	753,594
March	712,379	696,281	787,094	796,689
April	694,944	717,099	742,778	754,672
May	724,995	741,317	779,385	777,681
June	702,379	727,696	759,724	761,764
July	.....	736,199	757,839	761,087
Aug.	.....	740,210	756,658	781,150
Sept.	.....	708,206	738,231	771,567
Oct.	.....	679,764	751,290	792,339
Nov.	.....	658,701	722,839	783,066
Dec.	.....	641,245	722,419	774,462
Totals	4,147,484	8,420,659	9,022,212	9,295,538

Output of gold at Transvaal mines during the first from January, 1916, to the present time:

	1919	1918	1917	1916
Jan.	£2,871,718	£3,033,653	£3,324,418	£3,344,948
Feb.	2,704,647	2,802,477	3,063,976	3,201,063
March	3,025,992	2,957,614	3,343,363	3,384,121
April	2,951,936	3,046,045	3,155,121	3,205,643
May	3,079,583	3,148,915	3,310,618	3,303,377
June	2,983,515	3,091,058	3,227,101	3,235,767
July	.....	3,127,174	3,219,094	3,232,891
Aug.	.....	3,144,211	3,214,079	3,318,116
Sept.	.....	3,008,267	3,135,807	3,277,408
Oct.	.....	2,887,455	3,191,279	3,365,642
Nov.	.....	2,797,983	3,070,426	3,326,253
Dec.	.....	2,723,836	3,068,639	3,289,705
Totals	£17,617,391	£35,768,688	£38,323,921	£39,484,934

Schedule C, Now in Effect at Trail Smeltery

Consolidated Mining & Smelting Co. Issues New Schedule in Place of Schedule B—Action Follows Recent Investigation of Smelting Rates

VICTORIA CORRESPONDENCE

THERE has been dissatisfaction on the part of independent shippers of British Columbia with the treatment charges of the Consolidated Mining & Smelting Co. of Canada at its Trail smeltery as set forth in what is known as Schedule B. This, it will be recalled, led to an investigation by a special committee having authority from the dominion government, the report of which was issued a short time ago. The matter was discussed at a recent mining convention at Nelson, when it was announced by J. J. Warren, general manager of the Consolidated company, that a new schedule was being prepared and would be issued soon. This schedule, Schedule C, has now been published and is effective. It provides the promised reduction in ore-treatment rates and more especially affects those ores containing zinc and sulphur. The schedule is as follows, the introductory table being the basis of payment for silver and lead:

SCHEDULE C ISSUED BY CONSOLIDATED MINING & SMELTING CO. OF CANADA

SHOWING BASIS OF PAYMENT FOR SILVER AND LEAD

	Silver Payment, Per Cent.	Lead Payment, Per Cent.
10% zinc or under	95	90
Over 10% and including 11%	94½	89
Over 11% and including 12%	94	88
Over 12% and including 13%	93½	87
Over 13% and including 14%	93	86
Over 14% and including 15%	92½	85
Over 15% and including 16%	92	84
Over 16% and including 17%	91½	83
Over 17% and including 18%	91	82
Over 18% and including 19%	90½	81
Over 19% and including 20%	90	80
Over 20% and including 21%	89½	79
Over 21% and including 22%	89	78
Over 22% and including 23%	88½	77
Over 23% and including 24%	88	76
Over 24% and including 25%	87½	75

Silver: Will be paid for to the extent shown by the above schedule on the fire assay at the average of the *Engineering and Mining Journal*, New York, quotations for the second calendar month succeeding the date of sampling at Tadanac, B. C. In no case will the deduction from the silver assay be less than one-half (0.5) oz. per ton.

Lead: The lead contents will be determined by the wet method of analysis, deducting one and one-half units to arrive at the dry lead assay. Lead will be accounted for on the dry lead assay to the extent shown by the above schedule; provided, however, that in no case will the deduction from the said dry lead assay be less than one unit or twenty pounds per dry ton of ore.

The price for lead to be used in settlement will be our sales price delivered at destination in Canada less one and one-half cents per pound for refining and marketing as now in effect under the existing pooling scheme, which will be continued. There will be deducted also from the delivered sales price, $2.30 per ton on sales at Toronto and common points and $4.50 at Montreal and common points and similar differentials to other points. This freight adjustment is to cover actual increases in freights, e.g., should sales in any month be 2,000 tons and say 1,200 tons for delivery at Toronto and 800 tons at Montreal, the freight adjustment would be three-fifths at $2.30 and two-fifths at $4.50, or $3.18 per ton of lead.

The pooling scheme is outlined as follows:

(a) Settlement is based upon sales price as above provided and only to the extent of actual sales from month to month.

(b) Whenever sales are sufficient to settle for a full month's lead receipts, this is done promptly.

(c) Lead from our own mines is pooled with that purchased from others and is treated in exactly the same way.

(d) Each month a statement is issued showing the condition of the pool. All shippers have been sent a copy of the last one issued.

DEDUCTIONS

Smelting per dry ton of material, $9.50 as a base rate, which will be modified in accordance with the following formula:

(1) Add to the base rate per ton, 60c. per unit for all zinc contained.

(2) Deduct from this result the total units of silica, iron, manganese, lime and magnesia at 9c. per unit.

Provided that in no case shall said base rate be reduced more than $4 per ton as the net result of the said additions and deductions.

Provided, also, that in making the above computation, iron, silica and lime if 1 per cent or under, and manganese and magnesia if 3 per cent or under, will be disregarded.

Sulphur: A charge will be made in addition to the above for all sulphur contained in excess of 2 per cent, at 30c. per unit per dry ton of material, provided that such charge shall not exceed $3 per ton in any case.

Moisture: A minimum moisture deduction of 1 to 4 per cent will be made. The following penalty for moisture will apply to fine concentrates and clayey ore only: If over five per cent, charge for all contents at 10c. per dry ton per unit.

Size: Coarse and fine concentrates and ores should be shipped separately. If mixed so that over 30 per cent will pass through a ¼-in. screen, an extra charge of 50c. per ton will be made.

Sampling: If the shipment is less than a car lot or contains more than one lot per car, a deduction may be made for extra sampling, assaying, etc., of $10 per lot.

Weights and Samples: Those used in settlement shall be those made at the smeltery.

Representation: Shippers are expected to notify us as to who will represent them while their shipments are being weighed and sampled. Failure to do so will be construed as meaning that the smelter will have authority to appoint one of the local mine representatives at the shipper's expense unless the local shipper notifies us that a representative is not required.

Assays: Shippers will supply the smelter with their assays on smelter pulps shortly after sampling. In case of difference in assays requiring it, the umpire pulp will be referred to an umpire mutually agreeable. The party whose result is furthest from the umpire's result will pay his fee.

Settlement: (a) Shortly after sampling, an advance payment of 90 per cent of the apparent value is made. The prices used in estimating the apparent value will be the New York price for silver and the Montreal price for lead at the date of sampling.

(b) When final settlement is rendered possible by silver quotations being available for the second calendar month after sampling and by all of the lead received during the calendar month in which the ore is sampled having been sold, the final value will be computed and any adjustment necessary will be made between the smelter and mine.

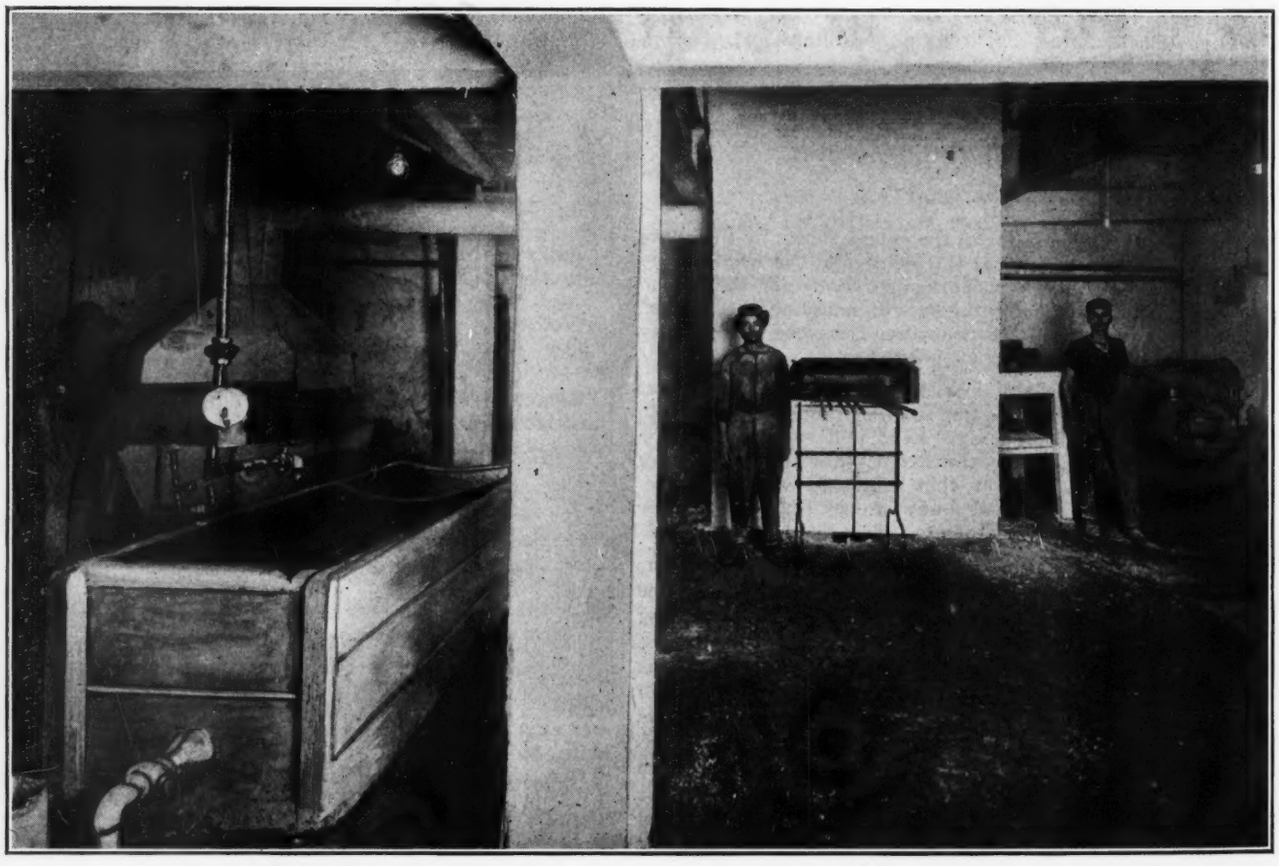
(c) Advances made on account will be carried by the smelter without interest until the last day of the second calendar month in which the ore arrives. Interest at 6 per cent will be charged on advances upon lead after that date.

The above rates will be effective on shipments received here on July 1, 1919, and are subject to change without notice.

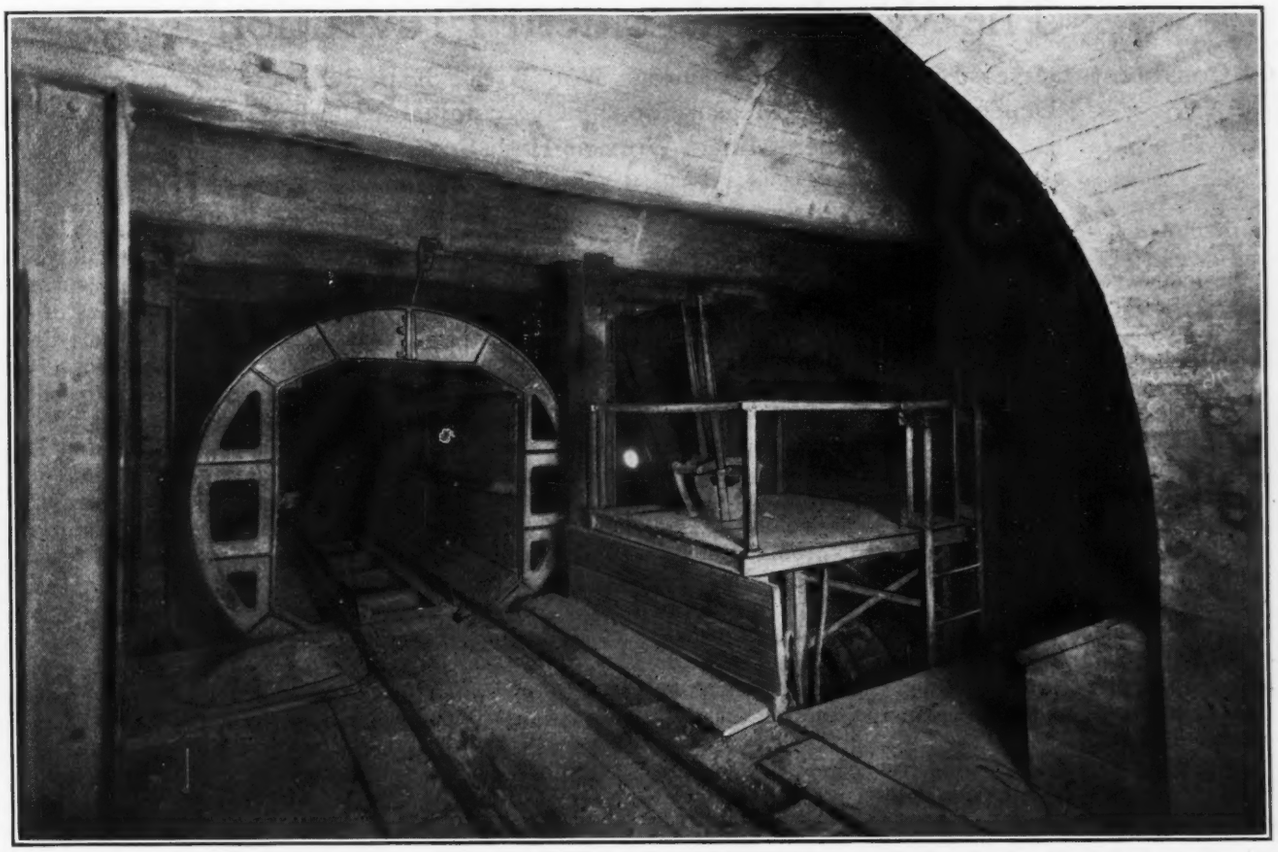
THE CONSOLIDATED MINING & SMELTING CO. OF CANADA, LTD.

Views Underground at the Ray Consolidated

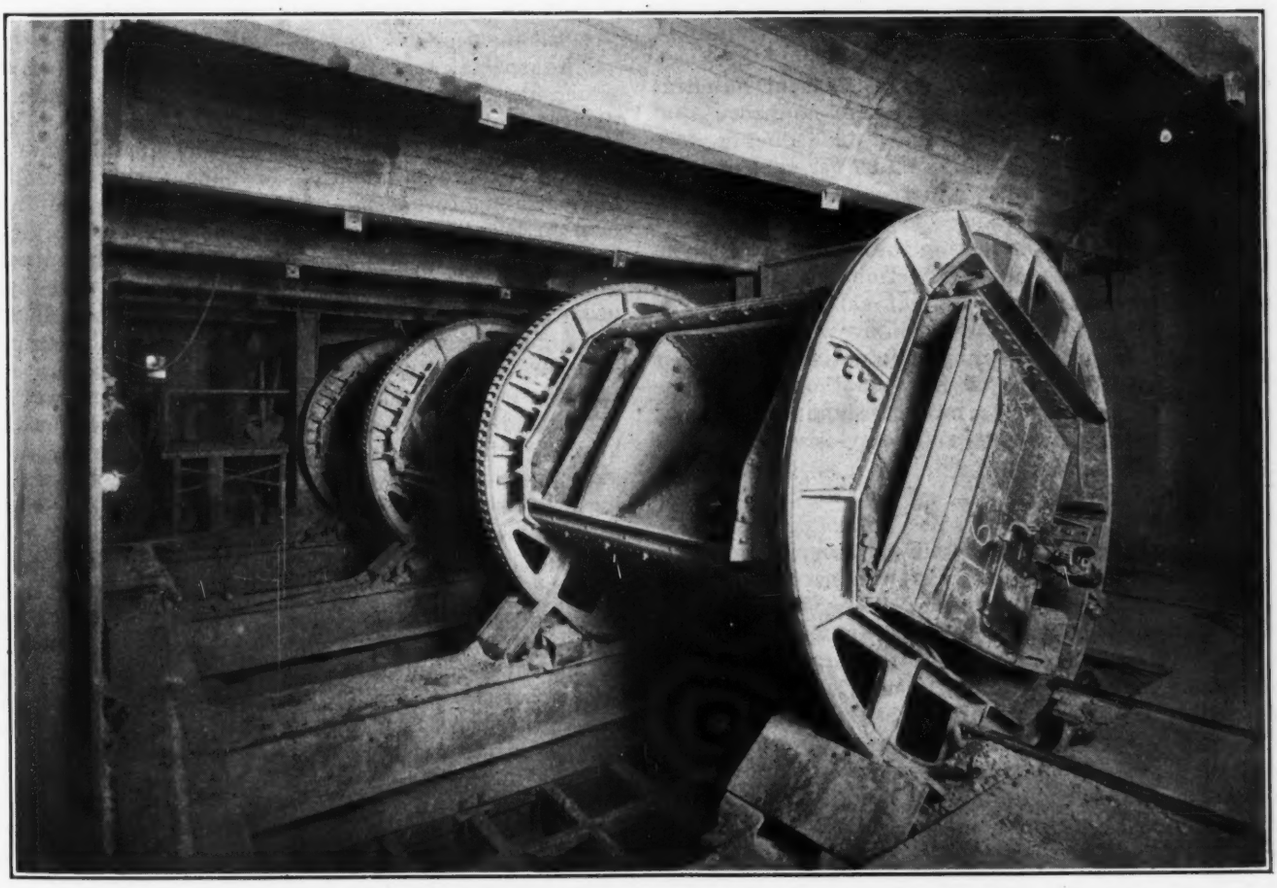
REINFORCED-CONCRETE SUPPORT OF DRIFT, NO. 3 LEVEL, RAY CONSOLIDATED COPPER CO., RAY, ARIZ.



UNDERGROUND BLACKSMITH SHOP AND TOOL-SHARPENING PLANT



CAR-DUMPING DEVICE ON THIRD LEVEL, RAY CONSOLIDATED COPPER CO.



TIPPLE IN POSITION OF DUMPING, RAY CONSOLIDATED COPPER CO.

The Work of Accident Prevention*

A Consistent Decrease in Accident Percentage Not To Be Expected—Low Accident Rates Dependent in Large Measure on the Overcoming of Carelessness When Miners Work at High Speed

BY WILLIAM CONIBEAR
Safety Inspector, Cleveland-Cliffs Iron Co., Ishpeming, Mich.

THE work of accident prevention in the mining industry in the United States has been in progress for about eight years. Its necessity and value in the economic life of the country may not be recognized and appreciated by all mine managements, although the movement is gaining momentum, and most operators are putting forth laudable efforts to eliminate personal injury to their employees. The entire country is awakening to the fact that this work is desirable not only from a humane standpoint but also as a business proposition. The voluntary aid which the Government has rendered through the Bureau of Mines cannot be overestimated, and those familiar with the situation and without prejudice must acknowledge that the responsibility of the operator of an iron or coal mine is lessened because of the assistance which is offered by the men whom the Bureau has stationed in the principal mining districts of the country.

An eight-year period is relatively short to use as a basis for a comparison from which may be deduced the results required to analyze the big problem of accident prevention. Safety experts of foreign countries state that it requires from ten to fifteen years to stop the natural tendency toward an increase in the percentage of accidents. It has been stated by men familiar with American industrial conditions that more than one-half of all accidents here are preventable. In support of this statement bulletins have been issued which cite figures to prove that certain operators have succeeded in reducing accidents in their mines or plants by 50 per cent or more during the first year or two of special safety activity. The publication of instances of this kind may be of value as a means of attracting the non-interested employer, but credit for such reductions may not be due entirely to a brief campaign of safety work. The annual fatality rates of the mining industry of the country may not show rapid fluctuations from year to year, but the rates of individual operators rise and fall and frequently a minimum annual rate may be followed by a maximum rate, or vice versa.

RESULTS OBTAINED BY SAFETY CAMPAIGNS VARY FROM YEAR TO YEAR

In 1911 one of the large mining companies organized a safety department, which was accepted wholeheartedly by all of its officers. Low fatality rates were obtained during 1911 and 1912; in fact rates that compared favorably with the low percentages prevailing in many foreign countries. A zealous safety inspector might appropriate this reduction and credit it to his department, but under these circumstances it would not be unreasonable to ask him to continue to produce similar results if he desired to retain his position; a most difficult task. The annual fatality rates of this country prior to 1911 show a fluctuation which varies as much as 150 per cent, and since 1912 the low rates of the first two years of the safety department have been reached but once. There has been no relaxation in safety precautions, but considerable effort and money have been expended to maintain as low an accident rate as possible. It is therefore evident that the rates of 1911 and 1912 were the result of the special safety precautions during the years when the swinging of the pendulum, which periodically has characterized the history of every mining company having a long life, had reached its lowest point.

EDUCATION OF EMPLOYEES AND INSTALLATION OF MECHANICAL DEVICES

It is not intended to minimize the value of safety work, but the fact should be recognized that, despite every effort to prevent personal injury, there is a fluctuation in the number of accidents which occur from year to year that is beyond control. This fluctuation may indicate that 50 per cent of the accidents about mines are preventable, and on the other hand, it may be advanced as an argument that, regardless of the best efforts, accidents are inevitable and it is useless to spend time and money in endeavoring to prevent them.

Two special features of accident-prevention work which have been emphasized in this country are safety devices and education of employees. There has been ample time in which to devise and install safety guards for the elimination of danger that is self-evident and preventable, but the problem of training men to be always on guard against personal injury appears to be more difficult to solve. If the miner of the United States is more careless of the first law of nature than the workman of other countries, I have failed to read or hear of a satisfactory explanation. The Director of the Bureau of Mines recently stated that the foreigner unable to speak English and working in the mines of this country was most liable to injury. Rules and regulations are printed in foreign languages, and as a general rule non-English speaking men associate with fellow countrymen who speak English more or less, so in a comparatively short time a miner is capable of understanding the habits and customs that prevail in the mine where he works. Hazards of coal or iron-ore mining are similar the world over, and the foreigner is not entirely ignorant of the danger that follows his trade. However, the number of those who do not understand English is so comparatively small that this phase of the problem may be considered negligible in the attempt to find a solution of the task that is offered by accident prevention.

The average fatality rate in the coal industry of the United States from 1911 to 1918, representing years during which time safety work was carried on,

*Paper read at the Lake Superior Metal Mine Safety Conference, Duluth, Minn., June 19-20, 1919.

was 3.37 per 1,000 men employed. For the eight years prior to 1911 the figure was 3.78, a reduction of 11 per cent. The average rate in the metal mines from 1911 to 1916 was 3.59 per 1,000, but there appear to be no figures available for the years prior to 1911. The death rate from various causes of accidents in and about all the mines of Great Britain has not reached three per 1,000 men employed since 1873, and the average rate since 1889 has been approximately 1.35. The history of mining in other countries also shows low fatality rates. Is the American miner, native born or foreigner, less skillful or more careless than the miner of foreign lands, or is he working under less favorable conditions, to account for this disparity in fatality rates?

The early history of coal mining in this country was characterized by low annual death rates; from 1875 to 1889 there were but three years in which the rate reached three per 1,000 men employed. Since 1898 there has not been a year when a rate less than three per 1,000 men employed has been attained. Why should a long record of low fatality rates be followed by so many years of much higher rates?

A comparison of the seven principal causes of accidents reveals slight fluctuation covering the two periods designated, namely, 1873 to 1898 and 1898 to 1918. Falls of coal and like occurrences were responsible for 46.68 to 48.81 per cent; mine cars and locomotives caused 12.59 to 13.48 per cent; gas and dust explosions, 9.82 to 14.95 per cent; explosions, 7.29 to 7.96 per cent; accidents in shaft accounted for 3 to 7.96 per cent; those on the surface, 7.10 to 8.70 per cent, and miscellaneous causes were responsible for 7.63 to 8.39 per cent. It is evident from these figures that no one or two principal causes can be designated and charged with the responsibility of the high fatality rate prevailing in the coal mines, and the same may be said of the iron-ore mines.

Industrial Development Has Demanded Increased Production

The development of this country has been rapid and extensive, and the demand for coal and iron has been so imperative that operators have been compelled to produce annually an exceedingly large tonnage. Rich resources have made possible the wonderful advancement which has marked the growth of industrial organization, but skill and efficiency in operation have not been neglected. The annual average production per man employed in coal mining from 1875 to 1898 was 458 tons, and from 1898 to 1918 it was 687 tons, a gain of 50 per cent. In 1873 it was 543 tons, and in 1879 it was 501 tons, whereas since 1899 there were but two years during which the annual production per man fell below 600 tons. This increase in production has been possible because large deposits of coal have been discovered, because invention of improved machinery has facilitated the handling of large outputs, and because the American miner applies himself more intensely and constantly to the daily discharge of his work than does the foreign miner.

In 1916 the iron-ore mines of Minnesota and Michigan shipped 66,748,466 tons of ore. Fatalities totaled 113, or an average production of 599,560 tons per each death. The same year Great Britain produced 14,845,734 tons of metal ore and suffered a loss of twenty-five employees, or an average of 593,821 tons per each death. When the risks involved in mining iron ore from the open pits of Minnesota are compared with those involved in deep underground mining, it must be admitted that the hazards of mining in this country should not be greater than those existing in distant lands.

The American mine operator is to be commended for the high degree of efficiency that he has produced in his profession. Nobody enjoys the benefits resulting thereby more than the American miner, whose mode of living is in keeping with the high ideals of American life. But the fact must be faced that no matter how intelligent or skillful one may be, he is more liable to injury when he works at a high rate of speed than when he works slowly.

During 1916, 174 men were killed in the copper and iron-ore mines of the Lake Superior district, and of this number 56, or approximately 33 per cent, were killed by falls of rock or ore from roof or wall. Methods of extracting ore are not responsible, because the best methods known to the profession have been applied. Is the miner, then, occupied so intensely in his work that he pays less attention to his personal safety than the miner in foreign lands? This would seem to be the fundamental question that is presented in the endeavor to find a solution to the problem of accident prevention.

Sicilian Sulphur Exports

According to the International Institute of Agriculture, which takes its information from official sources, exports of crude and refined sulphur from Sicily in 1918 were 230,769 metric tons, compared with 162,971 in 1917, 396,035 in 1916, 359,806 in 1915, and 338,308 in 1914. In January and February, 1919, there was exported 13,615 and 13,303 metric tons, respectively.

Stocks of sulphur on hand at the ports in Sicily were as follows, according to the same source of information:

Dec. 31	Metric Tons
1918	112,050
1917	156,801
1916	155,376
1915	323,391
1914	369,001

Automatic Tuyère Punching

The problem of punching converter tuyères automatically has to an increasing degree engaged the attention of engineers in recent years. Up to the present, however, none of the methods devised has found practical application. One reason for this is the fact that the tuyères do not always stay in the same place, gradually getting out of alignment, owing to the shifting of the lining of the shell.

The latest device for automatic punching to be patented[1] is the invention of C. J. Arch, of Douglas, Ariz. Each punch bar forms the piston of a motor actuated by compressed air or steam to give the necessary punch. When the punch bar of the first tuyère nears the end of the stroke, it automatically opens a valve admitting air to the second cylinder, and so on, the tuyères being punched successively. Apparatus is provided for cleaning and cooling the punch bars; also for cutting out any which it is not desired to operate.

[1]U. S. Patent No. 1,303,755, dated May 13, 1919.

California's State Mining Bureau

Present Organization Had Its Beginning in 1880, but Much Exploration Work Had Been Done in California in the Forty Years Preceding—Reports Cover All Phases of Mining Activities

BY WILSON T. LUNDY
Mining Engineer, San Francisco, Cal.

MINING has been the fundamental industry of California from the beginning, and it is therefore natural that questions relating to geology and mining should have received early official recognition. The present California State Mining Bureau was started in 1880, but prior to that time many steps had been taken leading up to its establishment. It may be of interest to recall some of the events that preceded the organization of the Bureau.

The U. S. Exploring Expedition, under command of Captain Charles Wilkes, U. S. N., visited California during the years 1838-1842 with James D. Dana as geologist. Mr. Dana's report represents the first official publication relative to the geology of the Pacific Coast region which was ever issued.

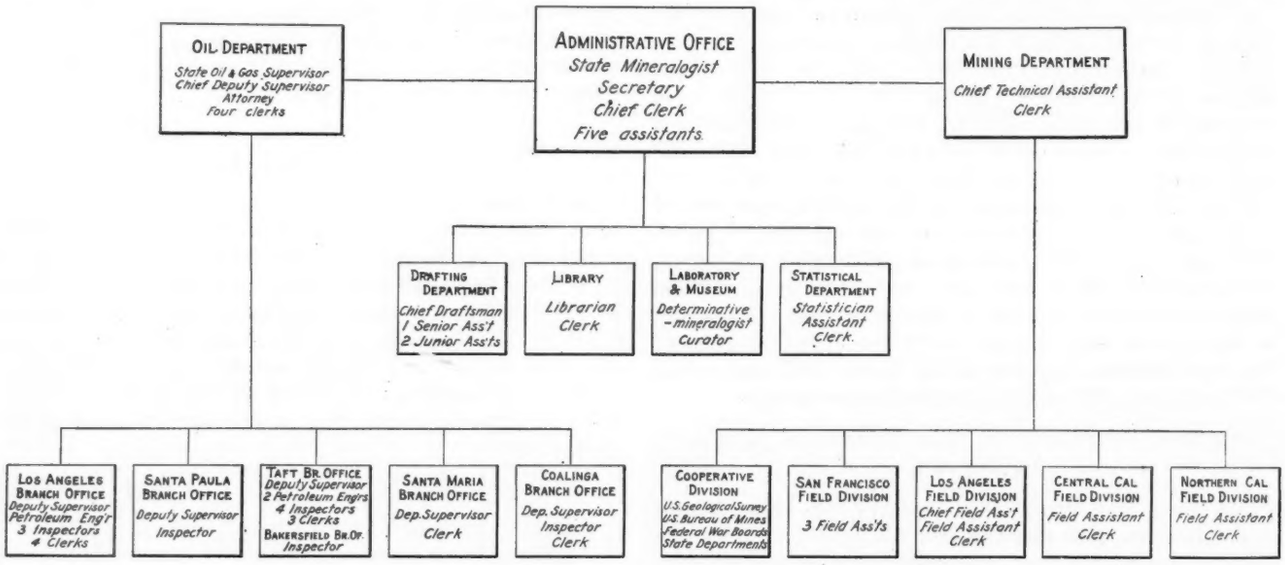
John C. Fremont explored California and Oregon during 1843-1844 with James Hall, of New York, the former's report being published in 1845. In 1849, Bayard Taylor undertook a reconnaissance survey of the state at the direction of Congress. In the same year T. Butler King and Philip T. Tyson were sent to California by the Federal Government, and a report on the geology and topography of the state from Benicia to the American and Calaveras rivers was published by the Senate of the Thirty-first Congress, as Executive Document No. 47.

In 1853-1854, under the direction of the War Department, an expedition was sent out to explore a route for a railway from the Mississippi River to the Coast. Twelve large volumes, known as the Pacific Railroads Reports, were printed as the result of this work. W. P. Blake was chief mineralogist and geologist of the expedition. Professor Blake, who later became State Geologist, was subsequently connected with the State University, and while there wrote several valuable books on California's geology and mineral resources.

OFFICE OF STATE GEOLOGIST CREATED IN 1853

On May 6, 1853, the office of State Geologist was first authorized, Dr. John B. Trask being appointed to the position. His first report was published that year, followed by others in 1854, 1855, and 1856.

The beginning of the present organization dates from Apr. 16, 1880, when the State Mining Bureau and the office of State Mineralogist were created, with Henry G. Hanks as first executive head of the department. Although since then there have been periods when the financial condition of the Bureau has been poor, nevertheless the office has operated continuously with the constant purpose of assisting the California miner to develop the resources of the state.



ORGANIZATION OF CALIFORNIA STATE MINING BUREAU

During the last few years the scope of the Bureau's activities has been considerably broadened. Previous to 1913 the department staff consisted of the secretary, determinative mineralogist, statistician, librarian and one geologist, the latter devoting his time to petroleum. At present there are under the State Mineralogist, the state oil and gas supervisor, secretary of the Bureau, mining engineer, chief field assistant, statistician, determinative mineralogist, four field assistants in mining, and five deputy oil and gas supervisors, together with assistants and clerks at headquarters in the Ferry Building, San Francisco, and at the branch offices, which are situated at 512 Union League Building, Los Angeles, and at Santa Maria, Santa Paula, Taft, Bakersfield, Coalinga, Auburn, and Redding.

The department of petroleum and gas was established by law Aug. 9, 1915. It is under the general jurisdiction of the State Mineralogist, who is authorized to appoint as supervisor an engineer or geologist experienced in the development of petroleum. This officer has supervision over the drilling, operation, maintenance, and abandonment of oil and gas wells, so as to prevent damage from infiltrating water and other causes.

OIL AND GAS WASTE LESSENED BY BUREAU'S WORK

It is of vital interest to the general public that waste of the natural supply of petroleum and gas in California be prevented, and much good has resulted in the short time which has elapsed since the work of this department was inaugurated. Much of the damage caused in the past has been owing to lack of knowledge of underground conditions. Information in this regard is being constantly gathered and systematized by the Bureau and the results placed at the disposal of all interested parties.

Since 1914 a detailed survey of the mineral and other industrial material resources of the state has been completed and the result published. The annual statistical bulletin showing mineral production has grown from merely a single tabulated sheet to a volume, and the information thus presented has proved to be of considerable aid to prospective investors and buyers of ores, as well as to the producers in the state. Many other reports covering the mining laws, detailed occurrences of useful minerals, production and transportation of petroleum, as well as geological maps, have been made available for the mining public.

BUREAU'S HEADQUARTERS CONVENIENTLY SITUATED

The Bureau maintains a technical reference library of more than 5,000 volumes at the main office in the Ferry Building, San Francisco, which is consulted by scores of mining men daily. Copies of all the leading mining and trade journals, as well as newspapers from most of the mining camps, are also on file in the reading room.

The museum, which occupies a floor space of 7,500 sq.ft. in the same building, is a valuable asset of the Bureau. Twenty thousand mineral specimens, a large proportion being from California, are on display and have been so arranged that a study of the minerals and rocks may be easily undertaken.

A laboratory is available where determinations are made, free of charge, on samples which any one in the state may send in. Advantage is constantly being taken of this service by hundreds of prospectors, who send their samples to the State Mineralogist, at the Ferry Building, accompanied by a letter, giving the locality where the minerals were found and the nature of the information desired.

A general mining information bureau is a well established feature of the State Mineralogist's office, and numberless inquiries, both written and personal, are answered daily relating to every phase of the industry. The chief object of the entire organization is to keep in touch with the practical side of mining in California, whether it be prospecting for, developing, producing, marketing or buying mineral substances. Technical and scientific problems are naturally important and also receive due attention.

Fletcher Hamilton is State Mineralogist, and the executive officers of the Bureau acting under his supervision are: W. W. Thayer, secretary; R. P. McLaughlin, oil and gas supervisor; E. S. Boalich, mining engineer and chief technical assistant in the mining department; and W. B. Tucker, chief field assistant. The accompanying chart shows the present organization of the Bureau in detail.

Mining in New Mexico in 1918 and 1919

During 1918 mines in New Mexico produced $681,000 in gold, 782,000 oz. of silver, 8,235,000 lb. of lead, 98,300,000 lb. of copper, and 24,100,000 lb. of zinc, according to the U. S. Geological Survey. The statistics for 1919 will show a considerable decrease in the output of all metals except gold. The Chino Copper Co., which in 1918 produced 79,340,372 lb. of copper and $39,732 in gold and silver, produced only 11,512,133 lb. of copper during the first quarter of 1919, owing to curtailment of operations. This company hopes to be able to continue operations at 50 per cent capacity. The Burro Mountain branch of the Phelps Dodge Corporation, which in 1918 produced 53,146 tons of concentrates averaging 14.9 per cent copper, has been so seriously affected by the drop in the price of copper that it has suspended operations. The Santa Fe Gold & Copper Co. has also ceased operations at San Pedro.

During the first five months of 1919 the 85 Mining Co., at Lordsburg, shipped a quantity of siliceous copper-silver-gold ore almost equal to that shipped by it during the entire year 1918. Development at Mogollon may maintain an output of silver equal to that of 1918, when the Fanny mill was operated only five months. The combined gold districts of Nogal, White Oaks, and Baldy have so far produced ore at an increased rate.

The decreased shipments of lead and lead-zinc ores from Magdalena and the discontinuance of the shipments of lead from the Organ Mountains district will greatly reduce the output of lead from the state. The suspension of operations at Pinos Altos and the curtailment of operations at Hanover and Kelly will naturally result in a greatly decreased output of zinc.

St. John Del Rey Mining Co., Ltd.

The eighty-eighth annual report of the Morro Velho mine for the year ended Feb. 28, 1919, shows that the mine yielded 167,854 tons, of which 4,312 tons, or 2.57 per cent, was rejected as waste. The total tonnage stamped was 165,000. The assay value of this in fine gold, after taking into consideration the value of the tonnage at the beginning and the end of the year, is 5.724 oitavas per ton, or 2.793 pounds sterling per ton, or a total value of £460,839. Of this there was extracted by the first process £312,000, and by the second process £111,000, or an extraction of 67.71 per cent and 24.09 per cent, respectively. The total yield was £423,000, or a total extraction of 91.80 per cent. There is, however, an unavoidable discrepancy in this, inasmuch as 310 tons of rusty concentrates, purchased in the vicinity, had to be run through the process, giving an estimated yield of £2,300, thus reducing the total yield from ore stamped to £420,700, and the extraction to 91.29 per cent, against a yield of £465,206 for the year previous, a falling off of £44,500, attributable to

the lower tonnage stamped and lower percentage of extraction.

The output from the mine was seriously affected by the epidemic of influenza, which reached Morro Velho at the end of October and continued with great virulence throughout November, during which month it was possible to raise only about half the normal tonnage of ore. The company's operations were also hampered by floods during the exceptionally heavy rainy season.

The profit for the year, £124,338, compares with £153,649 in the preceding year, and makes, with the balance of £21,135 brought forward, a total of £145,473, as compared with £157,736. The directors propose that the usual final dividend of 1s. 3d. a share should be paid, and that £35,000 should be transferred to capital works account, the balance of £19,255 being carried forward.

The increase in the size of the lode which has taken place in the lower horizons is a satisfactory feature. An improvement is shown in the ore, the assay value being 55.86s., as compared with 53.747s. in the previous year. The reserve at the end of the year is estimated at 1,209,104 tons. This reserve, if consumed at the full possible output of 192,000 tons per annum, will last 6.3 years.

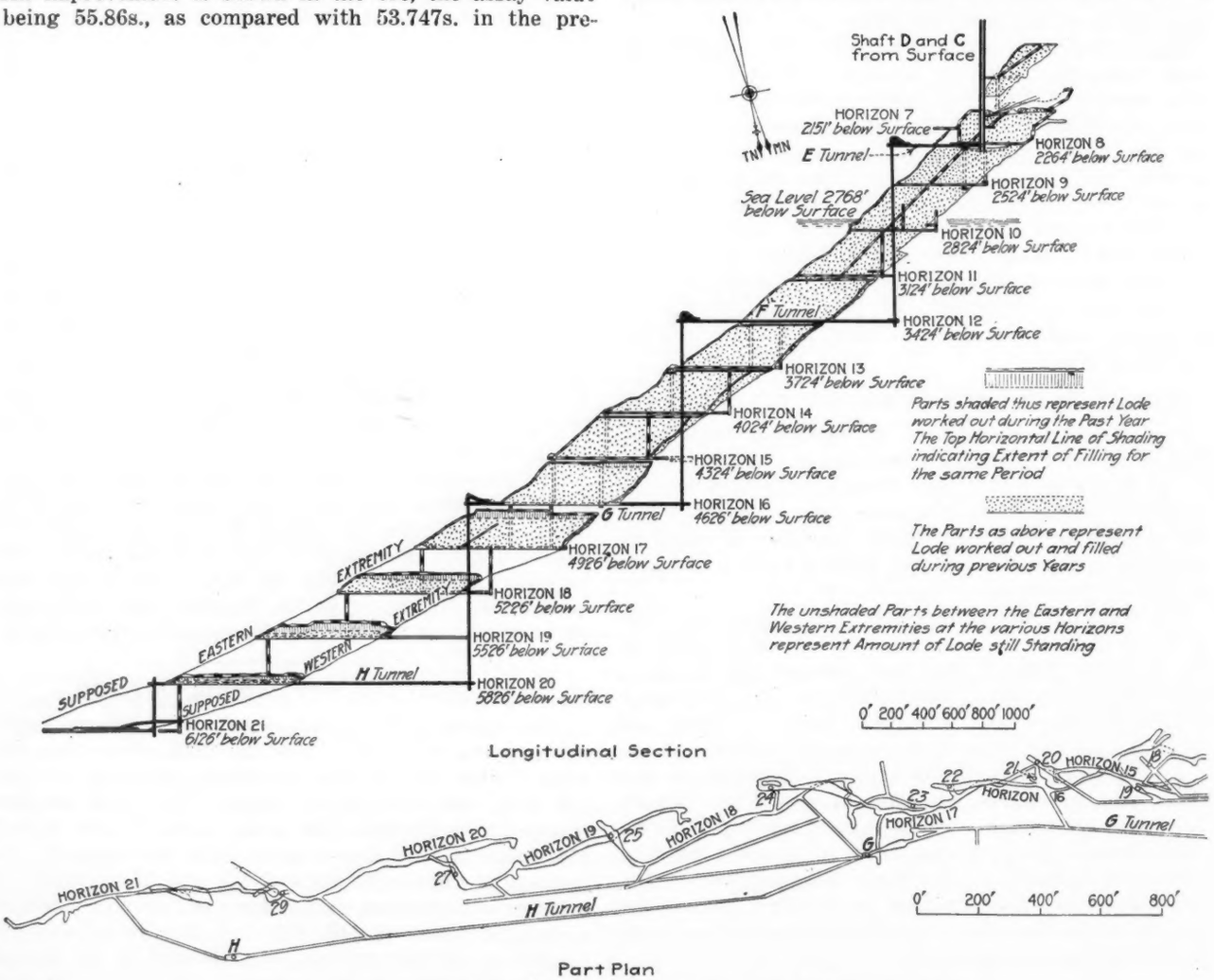
To illustrate the method of operating this famous property, the above extract from the annual report is accompanied by a longitudinal section and plan of part of the lower levels.

Mining in Venezuelan Guiana

Large Bodies of Low-Grade Ore Amenable to Cyaniding Await Capital—Changes in Mining Code—Hematite Mines Near Mouth of Orinoco

CIUDAD BOLIVAR CORRESPONDENCE

IN VENEZUELAN Guiana gold is found over a large area, extending from the Caroni River, an affluent of the Orinoco, to British Guiana, the greater part of which has not been systematically prospected. Even in the long-known Yuruary district, of which Callao, where the Callao mine is situated, may be called the center, the ground has never been proved below 1,000 ft. and then only before the days of the cyanide process. The quartz mines, with a few exceptions, are all within forty miles of this center. During the war, most of them closed down, partly owing to the heavy increase in costs and machinery and stores, wages having remained the same, but also to want of efficient administration, the usual fault in Venezuela. In 1914, there were six companies crushing ore, and at the end of 1918 only one, the latter on a very reduced scale. The output of gold, however, in 1915 and 1916 trebled that of 1914, owing to the production of alluvial gold from the upper Cuyuni River. In 1917 the output, according


Shaft D and C from Surface
HORIZON 7 2151' below Surface
E Tunnel
HORIZON 8 2264' below Surface
Sea Level 2768' below Surface
HORIZON 9 2524' below Surface
HORIZON 10 2824' below Surface
HORIZON 11 3124' below Surface
F Tunnel
HORIZON 12 3424' below Surface
HORIZON 13 3724' below Surface
HORIZON 14 4024' below Surface
HORIZON 15 4324' below Surface
HORIZON 16 4626' below Surface
G Tunnel
HORIZON 17 4926' below Surface
HORIZON 18 5226' below Surface
HORIZON 19 5526' below Surface
HORIZON 20 5826' below Surface
HORIZON 21 6126' below Surface
EXTREMITY
EASTERN
WESTERN
SUPPOSED
H Tunnel
Parts shaded thus represent Lode worked out during the Past Year The Top Horizontal Line of Shading indicating Extent of Filling for the same Period
The Parts as above represent Lode worked out and filled during previous Years
The unshaded Parts between the Eastern and Western Extremities at the various Horizons represent Amount of Lode still Standing
Longitudinal Section
0' 200' 400' 600' 800' 1000'
HORIZON 20
HORIZON 19
HORIZON 18
HORIZON 17
HORIZON 15
HORIZON 16
G Tunnel
H Tunnel
0' 200' 400' 600' 800'
Part Plan

DEEP-LEVEL DEVELOPMENT OF THE FAMOUS MORRO VELHO MINE

to government returns, was 30,800 oz. That for 1918 is not yet published, but is certainly less.

The alluvial goldfields on the upper Cuyuni are situated about eighty miles south of El Callao, and were first discovered in 1913. Since then concessions covering an area of approximately 35 by 55 km. have been taken up, chiefly by two syndicates, one of which shipped over 30,000 oz. in 1916 and 1917. The gold being recovered by means of bateas, toms, and rough sluices, the loss is considerable, and costs are excessive. Diamonds are also found in the same district, in the alluvial formation, mostly small but of good quality. They also occur in the Caroni and Paragua rivers in alluvial formations. The Paragua River lies west of the Caroni, of which it is an affluent.

Lack of Proper Roads Retards Gold Mining

At present the outlook for gold mining is not favorable, owing to the higher cost caused by the war and the want of good roads. There are, however, great possibilities in the district, as there are large bodies of low-grade ore, which requires only sufficient capital for opening and working on a scale large enough to reduce costs. The ore is easily amenable to treatment by the cyanide process. It is also probable that conditions of transport may soon be improved, as a private company is trying to arrange with the government for building a new road to the mines for motor transport.

During the last few years there have been several new quartz reefs located and worked within forty miles of El Callao, one of which shows considerable promise. They have, however, not yet passed the stage of prospects.

Stipulations Included in New Mining Code

A new mine code was passed by Congress in 1918, which came into force at the end of the year. The principal alterations are: 1. Increase of surface tax from one to two bolivars per hectare on quartz concessions, and from one-half to one bolivar on alluvial concessions, 2. It is no longer necessary to keep ten men employed on a concession after it has been declared in exploitation. 3. A concessionaire may at any time reduce the area of his concession, should part of it be of no value. 4. Concessionaires under previous laws have the option of adopting the new one. Concessions on quartz reefs can be obtained in blocks up to 200 hectares, and alluvial concessions up to 2,500 hectares. Both have to be either in squares or rectangles. The gold tax is the only other tax imposed and amounts to one-tenth bolivar. Under the mine code all machinery and mine stores can be imported free of duty, but in every case a permit to obtain the rebate has to be applied for. This does not cover explosives, to import which a special permit must be obtained from the government.

The Imataca iron mines are situated near the mouth of the Orinoco. They were opened and worked on a large scale by a Canadian corporation for a time, but closed down a few years ago, owing to the supply of ore being inadequate. This area is also worthy of further investigation, as the ore is hematite of excellent quality, and cargo boats can load at the mines. Gold has also been found in the same area.

It may be added that a large part of the country lying between the Caroni and Cuyuni rivers is suitable for raising cattle, the latter being easy to export via the Orinoco.

Alaska Juneau Gold Mining Co.

Increase in Bullion Production—Proposed Changes in Mill Construction—Deficit for the Year Ended Dec. 31, 1918, Amounted to $325,499

THE fourth annual report of the Alaska Juneau Gold Mining Co. for the year ended Dec. 31, 1918, shows the bullion produced amounted to 18,773 oz., valued at $334,255, compared with 12,923 oz., valued at $229,465, during the previous year. Production of concentrator amounted to 640 tons, valued at $125,188, compared with 1,419 tons, valued at $231,199, during 1917. Recovery of gold, silver, and lead averaged $0.80 per ton. The crude ore assayed $0.94 per ton.

The amount of development work done was only 5,501 ft., most of which was performed on Nos. 3 and 4 levels, making the total amount of development 81,564 ft. On the No. 4 level, in addition to 3,192 ft. of development, an area of 50,662 sq.ft. (slope measurement) was undercut. From this area and the development work, 1,339 muck samples showed an average of $1.49. The preparatory work necessary for this stope was about 95 per cent completed at the end of the year. The east half of the stope was completed in October, and four pillars and two powder drifts were blasted, about 40,000 tons being broken.

Gloryhole mining was conducted on the surface of the south orebody during the summer, and 47,934 tons averaging $1.73 was mined. The gold assay value for the entire mine as shown by 6,921 muck samples was $1.041. Tonnage sent to mill was 592,218, of which 540,757 tons was crushed in the new mill, 33,528 tons was stamped to ¼-in. mesh in the 50-stamp mill, 16,230 tons was rejected as waste, and 1,703 tons remained in the bins.

No radical change was made in the mill from the year before, but the attempt to force the ball mills to a duty that would give the entire mill its promised capacity was abandoned. A definite program was adopted for waste rejection on a large scale, and also for introducing refinements into the milling practice, which will increase capacity and avoid extremes in labor and supply costs. The estimated cost of carrying out these changes is $500,000, and upon completion the new equipment is expected to tram 16,000 tons per twenty-four hours, reject 8,000 tons as waste, and mill 8,000 tons of ore.

Unusually heavy rains in September caused a debris slide, resulting in damages amounting to $26,919 to the new mill and railroad. The company expended $166,973 upon construction work. Of this amount $104,674 was spent in the new mill, $30,508 in the power plant, and $10,805 in the 50-stamp mill.

The sum of $785,822 is debited on the profit-and-loss account, which includes mining, milling, and handling costs, plus marketing expenses, including storm damage. Bullion and concentrate production, plus other miscellaneous revenue, is credited with the sum of $460,322. The excess operating costs over revenue for the year amounted to $325,499.

Manganese Exports From Brazil during the first two months of 1919, according to a recent consular report, amounted to 59,270 metric tons, compared with 71,101 metric tons in the corresponding period of 1918.

CORRESPONDENCE AND DISCUSSION

Letters From the Mining and Metallurgical Industry Dealing With Pertinent Subjects of Interest

A Silverless Islet

I am interested in your article on "A Silverless Islet," which appeared on the "By the Way" page in the issue of July 19. On Aug. 17, 1897, I visited Silver Islet in company with a representative of the owners and was shown the maps of the property.

Mr. Winchell's description of the geology is correct. The country consists of a series of dark slates and other sedimentary rocks lying roughly in a horizontal position. Running east and west through the island is a dike of basalt standing nearly vertically. Running north and south through the island and cutting this dike at right angles is a vein which has a slight dip, in which direction I do not remember. The vein presumably continues north from the island and may be seen on the mainland cutting through the slates. The peculiarity of the vein is that where it cuts through the basalt dike the filling is calcite; but as soon as it leaves the dike and enters the slate the filling is quartz and the vein narrows up both to the north and to the south.

The story of the discovery of the island is well known, and the history of the exploitation of the mine is to be found in mining literature. After going down a certain distance the silver played out, and an attempt was made to prove its continuation at depth by a series of diamond-drill holes paralleling the dip of the vein. As I remember it, the result of this drilling was negative, but Captain Frue, the manager, was not satisfied, and sunk the shaft further, and discovered another body of silver ore, one of the drill holes passing within a few inches of it. When this second body played out I believe the shaft was sunk about 300 or 400 ft. deeper, and drifting done the full length of the dike, but no appreciable amount of silver was found.

One theory advanced is that the precipitation of the silver in the vein was due to the character of the slates, and that, where the vein was rich, the slates probably contained carbon, which acted as a precipitant for the silver. Carbonaceous slates are found in the country, and the report is that these were the conditions which obtained in Rabbit Mountain, a district where silver had been found previous to the discovery of Silver Islet. This theory is borne out by a statement made to me in Butte about ten years ago by a foreman in the Silver Bow mine who had formerly worked at Silver Islet. He told me that in driving a drift they had encountered inflammable gas, the phenomenon being similar to that found in coal mines. This would lend color to the theory of the carbonaceous slates.

The islet, however, is not silverless[1]. There still exists (or at least in 1897 there existed) the "silver roof." This was the top portion of the vein which was left as a pillar, or floor, to protect the mine from the waters of Lake Superior, and it was claimed that there was in this roof probably 100,000 oz. of silver. The owners of the property hesitated to take this out, having a lingering hope that, perhaps, some day the mine might be unwatered and explorations continued at depth.

Silver Islet, itself, when originally discovered, had but a few square feet of surface, but it was built up to quite a respectable area. The collar of the shaft had been carefully cemented in with asphaltum, so that presumably it was, and is, safe from the waters of Lake Superior.

Captain Frue, who managed the Silver Islet property, was the inventor of the Frue vanner, and designed it to fit the particular case of the low-grade ores from Silver Islet, which were concentrated on the mainland. At the time of my visit I was shown in an old barn a wooden vanner which, I was told, was the first machine that Frue had built. The belt was gone, and I presume by this time the vanner, as well as the barn itself, must have rotted away. Another relic on the shore was a clinker-built Mackinaw boat with a brass plate on it showing that it belonged to the British expedition led, I think, by Sir Garnet Wolseley against Riel in his rebellion.

The scenery on the shore of Lake Superior at that point is most impressive, Thunder Cape standing out boldly into the lake, the only evidences of civilization being the shafthouse on Silver Islet and a few of the old buildings on the mainland.

Most of the above is simply from memory, and if I have made errors I must be given credit for the lapse of twenty-two years. J. PARKE CHANNING.

New York, July 24, 1919.

[1]Mr. Winchell is not responsible for the title "A Silverless Islet" used over the article referred to, although the title is justified by the text.—EDITOR.]

Technical Ability and General Culture

Several years ago you published a diagram contributed by Mark R. Lamb, the purpose of which was to assist a mining engineer to gage his rank in the profession. As I recall it, the locality where the subject had worked was an important factor (Boston, the North, Latin America, and various other districts, being criteria as to his standing), and other curious considerations affected the distinction supposed to be due him. Although Mr. Lamb obviously had devised the diagram with his tongue in his cheek, someone took it seriously enough to remonstrate at the idea of incidental and external circumstances having so much weight in the appraisal of an engineer, and wrote to you, stating that in his opinion an engineer should be judged as to whether or not he could do efficient work at a mine.

Of course, efficient workmanship should be the principal basis on which a technical man is judged, and undoubtedly such is the practice of employers. Is it not possible, however, that the principle has been carried too far, and that men in modern industry have been

judged on too narrow a basis? The papers lately have recorded the extraordinary ignorance of a very successful technical man, Henry Ford, as shown in the testimony at his suit against the Chicago *Tribune*. In one narrow field Mr. Ford has shone brilliantly; of most other matters he is astonishingly unlearned.

His case very likely is an exceptional one, just as his financial gain has been exceptional. But is it not likely that many exceedingly unbalanced technical men have been given preference in industry over their broader-minded fellows for the sake of temporary results?

And has not the promotion of highly specialized but narrow-minded men into responsible executive positions made for unrest and discontent among the workers under them? Is it not possible also that in the long run a company loses by permitting a narrow-minded or ignorant man to represent it, for instance in contact with outsiders?

I am not arguing against high specialization. I am merely suggesting that technical men should know something about fields of knowledge other than their own, and that in the long run it pays a company to encourage men of wider outlook and more liberal culture than perhaps has been the case in the past. If I may be permitted to say so, nothing is more distressing than a "highbrow," as that term is commonly understood, and I am not advocating "high-browism" for engineers. A mine manager or superintendent, however, may be a man of liberal culture without being a "highbrow." The point is that he should not be a technical man exclusively, as Mr. Ford apparently is, and that Mr. Lamb possibly made a serious point after all.

P. B. McDONALD.

North Adams, Mass., July 25, 1919.

As a Miner Sees It

I have just read with a great deal of interest an editorial in the New York *Times* of July 16 entitled "Making Work by Stopping Work," and as the *Journal* is often read by working men I wish you would call their attention to that article.

As a working man I confess that I want to secure for my labor all that I can get for it. Through our union here and co-operating mine managers we have been receiving wages respecting which no one can justly complain, but yet there is some grievance, and it seems to come from two causes: First, many of us are afraid that the mine owners are at times making too much money and not dividing profits properly with us; and, second, we nearly all desire to secure just a little bit more for our day's work, with an equal desire to have that day shortened just a little.

Not being a professor of logic, I doubt if I could show a brother miner how he is thinking wrong, but I can tell how these matters appear to me.

It is my idea that about all of the earthly goods that we receive come as the result of work, and the harder we work the more of these goods we get. Some labor with their brains and some with their hands; generally they do it honestly and earn their living. A few brain workers and a few hand workers are dishonest and do not earn what they get, but these are in the minority and need not be considered.

We are told that labor receives from 60 to 75 per cent of the money paid out for producing copper, but it seems to me that it must be even more than this, for every one of the supplies, such as rails, timber, powder, and tools, is made by labor, and according to that view nearly 100 per cent of the money must go to labor.

I suppose there are some dollars paid for interest on borrowed money and things of that kind which figure in the cost of copper, but, getting down to brass tacks, it would seem that labor is getting pretty nearly all of the cost of the metal.

Between the producing cost and the selling price of the metal there is sometimes nothing, but generally the difference amounts to a few cents per pound, and it is the distribution of this margin that worries some of us. Personally I would like to see those few cents become many cents and know that they went to the men who had the nerve and good judgment to put their money into a business from which I make my living. "But it's unearned," my neighbor says; "and the fellow who buys copper isn't paying the price all to labor." Wrong. It is earned, and much more is earned that he never gets when you take into consideration the blanks that the capitalist draws while he is paying good wages for prospecting and developing.

As to these few cents' difference not going to labor, here again my neighbor is wrong. It goes to pay labor that has been stored up for the very purpose of helping us fellows over the rough places. This capital is simply stored up labor. Like the energy in a big flywheel, it runs pretty low sometimes, while we are getting ours right along, and we must give it a chance to build up when the building is good, so that there will be something behind us when another low-price day comes along. "But that's not labor," my neighbor insists.

I own a house that cost me $3,500, and I hold somewhat over fifty shares of Anaconda that cost me about as much. Every dollar that these two things cost me I got for working, and by working fairly hard I have put away about $7,000—half of it to work for me—and now my nest egg of $3,500 is just as much of a laborer as I am; better too, for it ought not to wear out and get stale.

As to wanting a little more money per shift and rather shorter shifts, it looks to me as though the unions, if they include most everybody, can keep on for quite a while, getting what we want a little at a time. But a fellow don't have to be a philosopher to see that some time the limit will be reached, and if all miners' unions are standing together we will wake up some day to find that the companies are getting no orders for copper. At about the same time we are going to hear from those unions that are using copper to the effect that their jobs are gone, that their employers can't buy copper, and they will be asking us to get to work, just as the users of coal in England are asking the coal miners to get busy now, according to the article quoted.

It may be that I view this thing all wrong, but it strikes me that the more copper we can get out the more jobs there will be in manufacturing plants where they use copper. This condition will cut down idle labor, make less idleness in this camp, raise the demand for labor and with it keep up the price or raise the price of labor here without anyone demanding it. Personally I know that the harder I work the more fun I get out of living. I know it is the case with some other men, and I wish I could prove it to some of my neighbors who spend a lot of time thinking how they can work less and earn more money at it. BUTTE MINER.

Butte, Mont., July 21, 1919.

ORE DRESSING AND METALLURGY

Practical Suggestions and Progress
in Invention and Use of
Mechanical Appliances

An Improved Copper-Casting Machine

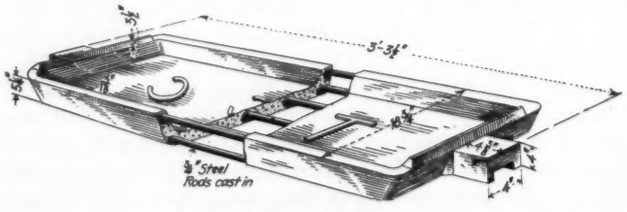
BY T. W. CAVERS

A simple and efficient copper-casting machine, suitable for plants producing from 15 to 30 tons of copper daily, has been installed at the smeltery of the Tennessee Copper Co. It was designed and manufactured by the engineering and mechanical staffs of the company.

The device consists of three long trucks, each carrying 14 molds, operated on a straight track by a small slow-speed electric locomotive; a cradle car on a track at right angles to that carrying the trucks; and a pouring ladle which is tilted by a small electric hoist. One man operates the ladle and both cars by means of two controllers placed close to the point at which the copper is poured. The pouring ladle is made of cast steel, and will hold about nine tons of copper when properly lined with a slag hull. It is provided with lugs so that it may be handled by the traveling crane. Below the lugs are brackets to support the ladle when set in the cradle car. Just beneath the lip is a bearing which rests on two cast-iron brackets attached to the car, and about which the ladle turns when copper is being poured. The ladle, lugs, supporting brackets, and bearings are one solid casting.

The cradle car is short and of heavy construction. Two cast-iron guides engage the brackets of the ladle when it is lowered into the car by the crane. The end of the car, opposite that from which the copper is poured, is weighted with heavy castings bolted to the frame to prevent up-ending. The mold car consists of a frame of 8-in. I-beams, riveted together, and set on two pairs of wheels provided with suitable bearings. Each car accommodates 14 molds; and three cars with the locomotive attached are operated on 165 ft. of track.

The locomotive is small but massive. Two pairs of wheels support a heavy cast-iron frame, to which additional castings may be bolted if greater weight is found necessary. The axle of one pair of wheels is geared to a 7½-hp. direct-current motor rated at 760 r.p.m. A worm gear provides the necessary reduction of speed.



CONVERTER-COPPER MOLD

At one end of the locomotive is a frame which carries three trolley wheels, and these provide connection between the three trolleys overhead and the motor. The motor is operated by a controller situated at the pouring stand. Three different speeds are permitted by means of the trolley system which has been mentioned.

Above the junction of the two tracks carrying the mold cars and the cradle car is a small electric hoist by means of which the ladle in the cradle car is tilted. The cable connecting the hoist with the ladle passes

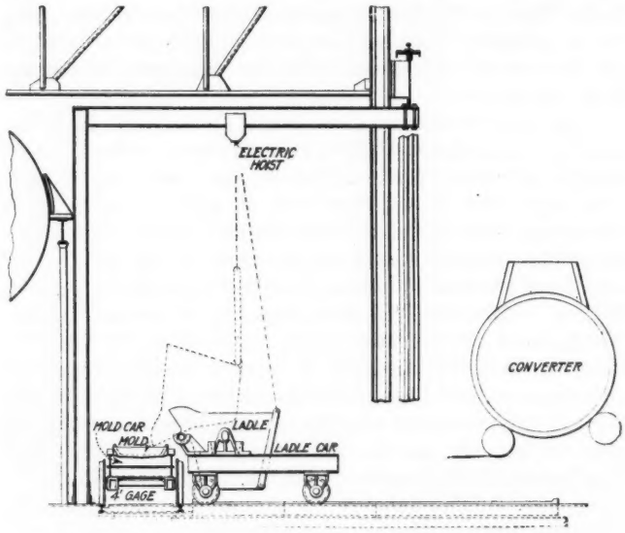
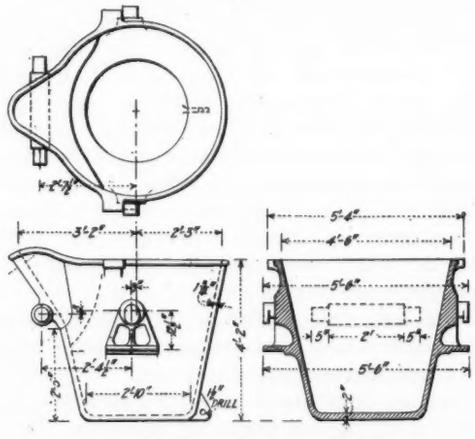


DIAGRAM SHOWING DETAILS OF OPERATION

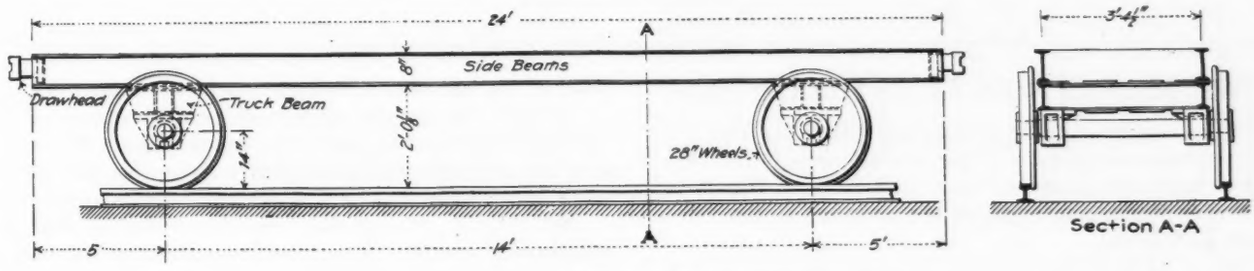
through a set of triple blocks, and the copper is poured as slowly as desired. The controller by which the tilting of the ladle is effected is situated beside the one used for moving the mold car, so that only one man is necessary for casting the copper.



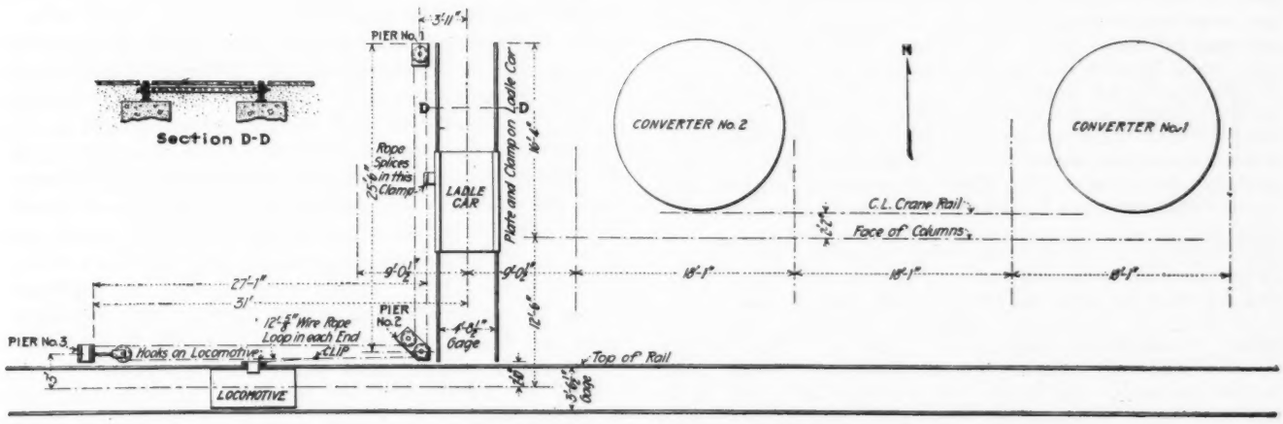
COPPER-POURING LADLE

Before a charge is finished, a ladle is prepared by filling with converter slag and allowing a hull about 1½ in. thick to form before pouring off the remaining molten portion. When the copper has been poured from the converter, the traveling crane transfers the ladle to the cradle car, which is then run out to the pouring position. The car is attached permanently to an endless cable and may be run in and out by "hooking up" to the

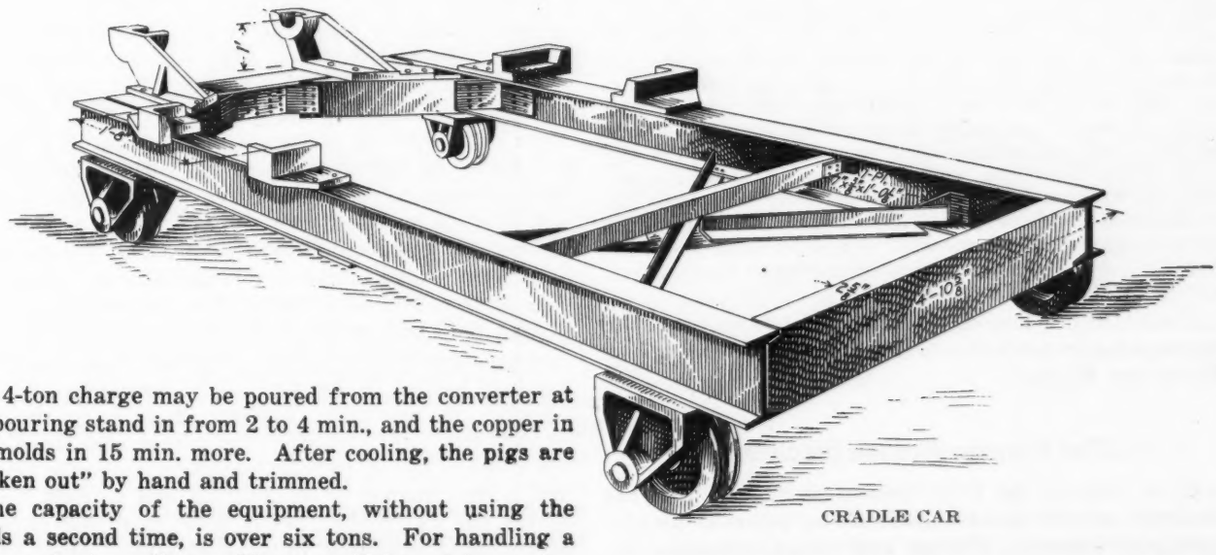
mold-car locomotive. When the hook at the end of the chain attached to the hoisting blocks has been slipped into the clevis of the ladle, the copper is ready for pouring.



MOLD CAR



GENERAL LAYOUT OF PLANT



CRADLE CAR

A 4-ton charge may be poured from the converter at the pouring stand in from 2 to 4 min., and the copper in the molds in 15 min. more. After cooling, the pigs are "broken out" by hand and trimmed.

The capacity of the equipment, without using the molds a second time, is over six tons. For handling a larger output, another mold car would be put in service. No difficulty is experienced with a copper skull in the ladle; and the slag lining is removed after each pour.

Features of Leather Belting

Tests to determine the characteristics of leather belting were recently conducted by Ernest A. Wilson at the Mellon Institute of Industrial Research of the University of Pittsburgh. The conclusions reached were as follows:

1. Leather belting possesses a much greater power transmitting capacity than fabric.

2. The advantage of leather over all the substitute belts persists at all speeds up to at least 5000 ft. per min., and at all tensions within the range practicable for power transmission.

3. The relative capacities of the various belts remain the same on various kinds of pulleys.

4. Leather belting, at its rated horsepower, possesses a big overload capacity, whereas fabric belts at much lower horsepower possess no overload capacity whatever.

5. Leather belting improves with age, though the fabric belts are at their best when new.

6. Wherever a fabric belt of a given width is carrying its load with some degree of success, a suitable leather belt three-quarters as wide will do better work than the fabric.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

War-Minerals Relief for the Small Producer

Liberalization of the statute providing for the relief of producers of certain of the war minerals is the object of a joint resolution introduced by Senator Henderson. Senator Henderson explains the purpose of the resolution as follows:

When the relief measure was originally introduced it was as a separate bill, but, with time pressing for adjournment, and so many matters before Congress, it had to be made an amendment to the Informal Contracts Bill to secure passage at that session. It was our original intention to take good care of the smaller producer and miner, as the larger operations were always in touch with the Government bureaus, and had undoubtedly received specific requests. But there were many small and practically unknown operators which the Government wanted to reach, and as chairman of the Mines Committee, I knew that Government agencies had given widest publicity to the war need for chrome, manganese, tungsten, and pyrite, and that their interviews, articles, and advertisements had appeared in probably every mining paper in the United States. Now, the Attorney General has so construed this act as to eliminate many of the smaller operators who relied upon this widely disseminated information. I am sorry that the act is so worded as to cause him to do this. It would seem to the prospector and miner, not knowing or caring about the finer legal technicalities, that such construction would imply that though a private concern can advertise its wants, the Government can not. I hope my resolution will remedy this situation. As a matter of domestic policy, it would be most unfortunate and unwise to so administer the relief act as to lose to the Bureau of Mines and the Geological Survey the confidence of the miner and prospector. For years these two bureaus have been the chief reliance of these men as to their country's wants. Their bulletins and publications have been accepted as the last word by the prospector, and if we do not now endorse and back up their late activities in stimulating the production of manganese, chrome, pyrite, and tungsten, we will destroy the structure of confidence and reliance in them which the Bureau of Mines and Geological Survey have been so long and so carefully building up.

A similar bill has been introduced in the House by Representative Garland, chairman of the Committee on Mines and Mining.

The Foreign Potash Situation

H. S. Gale, of the U. S. Geological Survey, who has returned recently from a painstaking personal investigation in Germany, France, and Spain, expresses the conclusion that though there are no large supplies of potash in either Germany or Alsace to be dumped into the United States, considerable supplies of fertilizer salts will soon be available and the amount of potash exported may increase rapidly.

Labor troubles, lack of fuel, inability to secure railroad transportation, the run-down condition of refining plants, and the general disorganization which prevails in Germany are responsible for a condition which will not permit the German mines to produce a great amount of potash in excess of domestic requirements.

Among the other important facts established by Mr. Gale in his personal investigation in Germany is that no appreciable surplus of potash was accumulated in Germany during the war. As a maximum, Mr. Gale does not anticipate that Germany will be able to furnish more than 50,000 tons of K_2O material for export to the United States. A similar amount probably will be available in Alsace. When these are added to the 30,000 tons which will be produced in the United States, the aggregate will be considerably below the amount needed for the coming crop season.

Mr. Gale encountered no reticence on the part of the Germans as to the giving out of information pertaining to their potash industry. They are anxious to restore normal conditions, as they recognize that potash in the future must be the cornerstone of their export trade. In addition to the actual physical difficulties of production, the Germans are facing the uncertainty as to national policy. Heavy taxes are certain to be levied, and as much of the burden as possible will be placed on exported commodities. This, combined with the increased wages which must be paid and higher costs generally, leads Mr. Gale to think that prices under $1.50 a unit for German potash need hardly be expected. In the course of Mr. Gale's investigation he discussed the situation exhaustively with Herr Schüddekopf, the general director of the Kalisyndikat.

Difficulty is being experienced in moving such potash as is available for importation into this country, on account of the fact that few ships can be prevailed upon to delay sufficiently to load potash. The high rate being paid for handling eastbound cargo makes it much more profitable for the vessel to turn around quickly and make the west-bound passage without cargo, or at least without a cargo requiring the amount of labor and time to load that are necessary with potash. As the east-bound rate falls, there will be an increasing inducement to load potash for ballast on the return trip.

In Alsace, Mr. Gale found that the seventeen shafts in that field had produced 40,000 tons of K_2O in 1913. The capacity for production, however, was greater and had been limited to that amount by the syndicate. That capacity can readily be attained again, as no malicious damage was done to any of the potash shafts. One of the mines is in a dangerous condition, owing to the fact that it was worked in an ignorant and careless manner during the war period, but it is believed that it can be put in good condition in a short time. Most of the lower galleries of the mine were flooded during the war, but, other than dissolving the salt faces back a few inches and making necessary some renovations of a minor nature, no damage was done.

Almost immediately after the armistice, the French took over the operation of the shafts. They were placed under military control, and technical men were assigned to the work. They are bringing the properties back into production very successfully. One property in the district is being operated privately, as it had been French owned prior to the war and is continuing to be operated by its owner. The other properties are

under the supervision of the Sequestre, the French organization exercising the function similar to that of the Alien Property Custodian in this country.

The total production from the Alsatian shafts in 1919 will reach 150,000 tons of K_2O, Mr. Gale estimates. Despite the urgent need on the part of the French to overcome the adverse trade balance, it will be impossible for them to export more than 50,000 tons.

As a result of his personal examination of the Spanish deposit which is forty miles north of Barcelona, Mr. Gale regards it as nothing more than a good prospect. It is the same type of deposit as are those of Germany. Boring has developed that it is extensive in area, but not comparable to the German deposits in thickness. A shaft is being sunk, but it has not reached the bed, which at that point is about 200 ft. beneath the surface. The working of the deposit will probably involve great practical difficulties. It lies in a valley through which runs a river, and the formation is such as to make the water problem a most serious one. A former shaft had to be abandoned because of inability to handle the great volume of water which is made.

Though Mr. Gale did not visit the African deposits, his information is that the prospect of important production is slight.

Tariff on Tungsten Ore

A tariff of $10 per unit on tungsten would fix the price of American mined tungsten at $18 to $20, in the opinion of the majority members in the Committee on Ways and Means. The establishment of a domestic tungsten industry is held to be of vital national importance, especially in view of the fact that cheap sources of supply in all parts of the world are disappearing, with the probability that this country may find it necessary to supply all of its needs from domestic mines. Extracts from the report of the committee, which was written by Representative Timberlake, of Colorado, are as follows:

Competent witnesses stated that, under normal conditions and the protection asked for, the domestic mines could produce 50 to 60% of the amount consumed in ordinary domestic manufacture and the remaining 40 to 50% would of necessity be imported. Eventually, however, the percentage of imports would be greatly reduced and the domestic demand almost wholly met by domestic production.

The evidence of the U. S. Tariff Commission shows that about 50% of the domestic output is produced at a cost of $10 to $15 per unit and 50% at a cost of $15 to $25 per unit, averaging $20.

The evidence shows that the present added cost of tungsten production in the United States is not based entirely upon increased labor cost or on that of supplies. It is in part a physical condition due to the fact that the surface deposits, which were mined very cheaply, averaged up to 60 and 65% tungstic trioxide. Operators who testified explained that as mining operations extend downward into the ground the percentages of tungstic trioxide are gradually reduced from 65 to as low as 4 and 5%, and these ores then have to be concentrated by the miner to a high-grade product, analyzing about 60% tungstic trioxide. To illustrate the point, it would take about 15 tons of 5% ore to concentrate into 1 ton of 60% ore, after making due allowance for the loss occurring in the process of concentration. The necessity of making this concentration compels the installation, equipment, management, and maintenance of large, costly mills and concentration plants, as an entire new element of cost in addition to the cost of development and extraction of the ore. Because of these facts the protection asked for is not due solely to the difference in labor cost between the countries.

A careful analysis of mining conditions in the Orient furnished ample evidence that 60% ores may readily be delivered to our seaboard from southern China at $6 or $7 per unit and still afford the Asiatic miner a fair profit. The labor employed in mining Asiatic tungsten ore is coolie labor, which is reported as being paid approximately 50 cents per day for men and 20 cents per day for women and children. Most of the deposits of South America are mined by native Indian laborers, who are paid somewhat better than the coolie labor of China. In Portugal women and boys are used in the sorting of ore at a daily wage of from 16 cents to 20 cents. Mine labor, recruited from the peasant classes, is paid from 50 cents to 60 cents per day.

Suspension of Assessment Work

Only one vote was registered in the House of Representatives against the bill providing for the suspension of requirements of annual assessment work during 1919. An attempt was made to amend the measure so that no suspension would be granted to any one claimant for more than three claims. This was disapproved, however, and the committee amendment limiting the suspension to five claims carried. Objection was made to the committee amendment allowing the bill to apply to oil-placer locations. This was explained by Representative Taylor as follows:

The Mines and Mining Committee has never been in favor of making any discrimination in annual assessment work between oil-placer claims and any other kind of placer or lode claims, and there is no reason now why one should be exempt and another not. The last time this bill was passed by the House, in 1917, the gentleman from Wyoming (Mr. Mondell) inadvertently, I think, made the motion on the floor of the House to amend the bill to exempt oil-placer claims for the suspension, and his amendment was adopted, and so the oil-placer claims have been required to do the annual work during the past two years that all others have been relieved from.

Validity of Public-Land Locations

Representative Vaile, of Colorado, has introduced a bill providing "that where public lands containing deposits of gold or iron ore have heretofore been located in good faith under the placer-mining laws of the United States, and assessment work has been annually performed thereon, such locations shall be valid and may be perfected under the provisions of said placer-mining laws, and patents, whether heretofore or hereafter issued thereon, shall give title to and possession of such deposits."

War Department To Sell Chemicals

Bids have been requested by the War Department for the purchase of 46,000 lb. of aluminum trichloride and 900,000 lb. of white arsenic. These lots of chemicals are offered f.o.b., Ben Hur Plant, Willoughby, Ohio, and the bids will be opened at 10 a.m. on Aug. 22 at the Zone Supply Office, 1819 W. 39th St., Chicago, Ill. No bid for less than a carload lot of the white arsenic will be considered. No minimum is established for the offering of aluminum trichloride.

An investigation of the oil-shale resources of the United States is provided in a bill introduced recently by Senator Henderson, of Nevada. The bill carries an appropriation of $140,000 and specifies that the work is to be done by the Bureau of Mines.

Work of the War-Minerals Relief Commission

Satisfaction Expressed at Open and Fair-Minded Attitude of Commissioners at the Hearings Conducted in Western States—Number, Character and Amount of Claims—Further Action By Congress Needed To Protect Producers Excluded Under Recent Ruling

SAN FRANCISCO CORRESPONDENCE

THE shortage of shipping during the latter part of 1917 and throughout 1918 caused general attention to be directed to the problem of maintaining the supply of minerals and ores critically needed in the manufacture of war materials. Pronounced decreases in the available supply of manganese, chrome, pyrites, and tungsten, as well as some minor minerals, were expected to result, and to anticipate such a condition active steps were undertaken to stimulate domestic sources of supply. The War-Minerals Act, by which it was proposed to make about $50,000,000 available for the development of and production from domestic mines of the needed minerals, was introduced in Congress, and, after considerable discussion and change, the measure received the signature of the President on Oct. 5, 1918, and became a law.

Practically no expenditures were made under the new law, as oversupplies of some of the important minerals began to appear, and by December, 1918, the Department of the Interior officials realized that the War-Minerals Act was a white elephant, as the signing of the armistice on Nov. 11, 1918, removed the necessity for further intensive development of domestic sources of minerals. The statute was so worded that the appropriation could not be used to defray expenses incurred by private individuals and corporations in anticipation of its passage.

Prior to the passage of the War-Minerals Act, concerted efforts were undertaken to start domestic production of manganese, chrome, pyrite, and tungsten. The price for manganese was fixed by the War Industries Board on June 1, 1918, and was sufficiently high to attract the attention of mining men and others, which fact, taken in conjunction with the appeals that were made on the score of patriotism and war needs by various Government organizations, resulted in widespread and successful effort in opening up manganese deposits in many states.

Financial assistance loomed up as it became apparent that the War-Minerals Act had possibilities of passage. So successful were the efforts of the producers that by Nov. 2, 1918, a surplus of manganese ore had been developed, and with the signing of the armistice the market for metallurgical ore disappeared and remained in this condition for a number of months.

The market for chrome ores was high during the greater part of 1918, and this was in itself a sufficient inducement to stimulate production from sources already producing or from producers who were already operating. The appeal to patriotism and the energetic efforts of the same Government agencies were all that was necessary to cause a great number of individuals and companies to enter the field and to find and develop new deposits. On July 13, 1918, the ruling price for chrome was $1.50 per unit for 40 per cent ore, but in the latter part of September an oversupply began to appear and the price of chrome ore became weaker and reached a nominal condition. With the signing of the armistice, the market disappeared completely. Chrome ore is now offered in California at 50c. per unit.

A similar condition ruled in the tungsten industry, although this industry had been established in the United States for several years in a stable condition. Nevertheless, under the same stimulation new producers came into the field and new deposits were developed. With the signing of the armistice the market for tungsten ores became sharply depressed, and the price declined from $24 per unit to the present nominal quotation of $10. A similar state of affairs, although to a lesser degree, perhaps, than in the case of the before-mentioned minerals, prevailed in the pyrites industry.

The disappearance or practical curtailment of the market for these minerals left many projects in a state of uncertainty, and many of those interested faced large financial losses, owing to their energetic efforts to assist the Government in its prosecution of the war. It was realized that a moral responsibility rested with the Government to straighten out the situation for the producers and potential producers, and it is a matter of satisfaction to record that there was no tendency on the part of officials to dodge this obligation. Nevertheless, it is probable that little would have been done had it not been for the efforts of the Pacific Coast Chrome Producers' Association, the American Mining Congress, and others. Because of their energetic representations before Congress, the War-Minerals Relief Act was passed as the best solution of the difficulty.

Under the provisions of the War-Minerals Relief Act, the sum of $8,500,000 was appropriated for the expense required and for the settlement of the claims arising out of the stimulation of the production of manganese, chrome, tungsten, and pyrites. The Secretary of the Interior was required under the act to adjudicate the claims and appointed a commission to undertake the settlement of the claims by recommending to him such sums in the case of each claimant under the act as the commission considered just.

ORGANIZATION OF THE WORK OF THE COMMISSION

The commission as organized consists of the chairman, John F. Shafroth, former Senator from Colorado; M. D. Foster, former Representative in Congress from Illinois, and Philip N. Moore, former president of the American Institute of Mining and Metallurgical Engineers. H. E. Meyer is secretary of the commission and Paul S. Black, counsel. In addition, there are clerks and stenographers.

The following engineers, under the direction of J. E. Spurr, of the U. S. Bureau of Mines, are engaged in making field investigations of claims where requested by either the commission or claimants: Fred P. Williams, of Batesville, Ark.; Curtis B. Locklin, of Los Angeles, Cal.; R. Clyde Cameron, of Berkeley, Cal.; Harry J. Sheafe, of Saratoga, Cal.; Bidney L. Shonts, of Prairie City, Ore., and Stanley C. Sears, of Salt Lake City,

Utah. The auditors, whose function is to examine and determine the accuracy of the accounts kept by the claimants, are as follows: William H. Dunn and R. C. Evans, of Batesville, Ark.; Guy L. Langron, of Los Angeles, Cal.; Arthur S. Trelawney, of Prairie City, Ore.; P. F. Roosa, of Phillipsbury, Mont., and E. L. Fleming, of San Francisco, Cal.

After the organization of the commission, a questionnaire was sent out, which was to be filled by each claimant and filed with the commission at Washington not later than June 2, 1919. By law, no claim filed later than June 2 could be considered under the Minerals-Relief Act. The questionnaires contained questions designed to bring out the principal facts forming the basis of the claim made by the claimant. In addition, each claimant was allowed to file such supplementary information as was deemed necessary more fully to substantiate his claim. In some instances maps and photographs of operations were included.

Under the act the Secretary of the Interior was authorized to adjust, liquidate, and pay such net losses as have been suffered by any person, firm, or corporation, by reason of producing or of preparing to produce manganese, chrome, pyrites, or tungsten in compliance with the request or demand of the Department of the Interior, the War Industries Board, the War Trade Board, the Shipping Board, or the Emergency Fleet Corporation. The Secretary of the Interior delegated to the commission the task of investigating the claims and of making specific recommendations to him for their proper adjustment. Under this authority the commission began holding hearings of important claimants and such claimants as desired to be heard. These hearings have taken place in Washington, St. Louis, Mo.; Little Rock, Ark.; Tucson, Ariz.; Los Angeles, Cal., and San Francisco, Cal. Additional hearings are to be held in Medford, Portland, and Baker City, Ore.; Spokane, Wash.; Butte, Mont.; Salt Lake City, Utah; Denver, Col., and a final hearing in Washington, D. C.

Classification of the claims, the work of the field engineers and auditors, and all clerical work necessary to the advancement of the investigation toward completion are proceeding simultaneously with the hearings. It is expected that the work of the commission will be completed in the autumn of this year.

The commission has applied itself diligently to a task which is recognized by all as being extremely difficult. The first case, the claim of the Chestatee Pyrite Chemical Corporation, was heard in Washington during April and May, and has already been reported in the columns of the *Journal*. In all, 1,287 claims, totaling $18,000,000, have been filed.

At the hearings in San Francisco, July 5 to 25, a representative of the *Journal* was in attendance for a part of the time and had an excellent opportunity of observing the work of the commission. Though the burden of proof rests with the claimant, it was evident that the commission approached each case with an open mind and made every endeavor fairly to determine the pertinent facts surrounding each claim. The principals in each case heard were asked to appear, and, though they were permitted to have an attorney present, the commission obviously preferred to have the claimant state his own case. In some of the hearings the claimant's attorney conducted the examination, assisted by the commissioners whenever it was necessary to go deeper into particulars.

Maps and any additional papers that were required to substantiate or make clear the replies in the questionnaire were presented and were filed along with the original claim. In general, the questions asked by the commissioners were along the lines of establishing the chronological sequence of the events leading up to the claimant's entry into the business of mining the particular mineral in question, the amount of actual development done, and the ore produced and sold, as well as the road, trail, mill, or other construction necessary for access or operation. The statements of costs were inquired into, and explanations were asked of such items as were not clear. The ownership of the property and the way in which it was acquired were brought out. Claimants were asked whether they considered the project a commercial one at the time of beginning work and also at the time of discontinuing operations. Such facts as the thickness of the vein of mineral, its grade, royalties to be paid, and wages and salaries allowed were ascertained where pertinent.

The hearings were conducted with rather less formality than is customarily found in a court of law. In fact, the commissioners endeavored to get around the table with claimants and secure a free and frank discussion of the merits of each case. How much patriotism and how much the desire to make money were motives for taking up a project were fully and pleasantly discussed. Both claimants and commissioners recognized the difficulties of the situation, and each met the other, with few exceptions, in a broad spirit of mutuality.

Important Claims in California

There were about 290 California claimants, of which over 233 were for chrome, 34 for manganese, 8 for chrome and manganese, and 5 for tungsten, and there was one claim for tungsten and chrome projects. Among some of the more important claims presented to the Minerals-Relief Commission at its San Francisco sessions were the following:

Claim No.	Name	Amount of Claim
1018	Pacific Tungsten Co.	$444,880.00
1180	Placer Chrome Co.	205,867.60
771	Steele Chrome Co.	138,929.51
1020	F. M. Neely	133,470.26
648	C. S. Maltby	77,500.00
55	St. Anthony Leasing Co.	75,000.00
684	Holbrook & McGuire	11,850.00
955	Holbrook & McGuire	33,193.00
1163	Holbrook & McGuire	8,851.00
697	Noble Electric Co.	67,555.81
807	Western Rock Properties	59,353.00
274	Whitney & Loss	54,855.00
680	Tedoc Co.	49,807.00
760	Sawyer Tanning Co.	7,662.76
761	Sawyer Tanning Co.	20,192.55
762	Sawyer Tanning Co.	10,129.71
1178	H. H. Noble	35,114.00
970	S. L. Schwartz	12,976.00
971	S. L. Schwartz	10,145.00
917	Santa Margarita Chrome Co.	31,714.83
1113	Dickey, Druebeck & Murry	30,836.60
136	Sulphur Gulch Mining Co.	29,370.00
170	J. F. Barnebery	20,693.00
691	F. W. McNear	20,149.00
961	Western Ore Co.	19,380.00
1069	Daisy Chrome Co.	19,154.81
533	Hillside Mine	16,921.80
156	Wells Chrome Co.	15,868.00
410	Samuel Dolbear	15,493.69
133	Hymer and Rufener	14,266.47
937	Frank W. Griffin	14,250.00
864	G. Howard Garrison	13,733.40
48	J. Bouse	13,000.00
771	A. H. Jarmen	138,929.00
750	Holter & Faucher	14,172.00
1107	J. T. Geisendorfer	10,912.00
44	K. G. McLoughlin	15,000.00

At San Francisco about 180 claimants were heard. At St. Louis, out of 25 claimants, 16 were given hearings. At Little Rock, out of 63, 11 claimants were heard. At Tucson, out of 33, 11 were heard; and at Los Angeles, out of 79, 35 were heard. As only

a small percentage of the questionnaires were fully and adequately prepared, the necessity for hearing as many cases as possible was recognized by the commission early in the inquiry, and every effort was made to have claimants attend the hearings.

The most important claim presented at the San Francisco hearing was that of the Pacific Tungsten Co. The amount of this claim was $444,880. The ownership of the Pacific Tungsten Co. is vested in W. J. Loring, of the firm of Bewick, Moering & Co., San Francisco, Cal.; Charles H. Sergerstrom, of the First National Bank, of Sonora, Cal., and Edward A. Clark, of Boston, Mass., as well as other stockholders. W. J. Loring was the principal witness, and the examination was conducted by Judge John F. Davis. The mines of this company are situated eight miles from Mill City, Nev. The company operated two groups of claims, totaling 76 mining claims, covering an area of 1,850 acres. The first claims were acquired March 6, 1918, and it was then proposed to start operations with a mill of from thirty to forty tons' capacity.

Upon representations made by Government agents of the great need for tungsten production, the first plans were enlarged, additional mining ground was acquired, refinancing undertaken, and a mill of 125 to 150 tons' capacity erected. The mill was finished on Nov. 15, 1918. Buildings, a four-mile narrow-gage railroad, and power lines were constructed. An extensive water system was installed, and preparations for the rapid production of a large tonnage of tungsten ore were made. The failure of the tungsten market left the company in financial difficulties.

The recent interpretation of the War-Minerals Relief Act by the U. S. Attorney General, which was given in full on page 107 in the *Journal* of July 19, will materially reduce the number of claims which will be allowed by the commission. Under this ruling only those claimants who received a request from the Department of the Interior, the War Industries Board, the War Trade Board, the Shipping Board or the Emergency Fleet Corporation stand a possibility of securing a return of their expenditures. Undoubtedly there are many claimants who responded to the widely spread requests which emanated from official sources and who did not receive a specific request either by letter or from an authorized agent. This is a greatly to be regretted outcome, and it would seem that the commission should take active steps to determine the justice of such claims and recommend them for further action by Congress, as that course appears to be the only solution of the present difficulty.

Water Jack-Hammer Contest At Tonopah

Exciting Tests in Which Individual Skill and Quickness, as Well as Judgment in Selecting Sharp Drills, Win Decision

BY J. A. CARPENTER
Consulting Engineer, Tonopah, Nevada

THE big event of Tonopah's Fourth of July contest this year was the water jack-hammer contest, which was carried out on a large block of granite placed at the intersection of the main streets of the town. The published conditions covering the contest were as follows:

Open to miners of Nye, Esmeralda, and Mineral counties.

Purses—$1,000, the money to be divided as follows: $400, first; $300, second; $200, third; $100, fourth.

Entrance Fee—$10 per man. Entrance fee must accompany application. All contestants must be vouched for by superintendent of mine employed.

Rock—California Rockland granite.

Kind of Drills—Jack-hammer class, with piston of not over 2⅝-in. diameter. Drill not to weigh over 50 lb. Either new or old machines from stock.

Time—Seven minutes, including connecting up air and water.

Holes—Vertical holes, water jack-hammer held by hand. All holes to be blown before measuring.

Bit—Any style. No bit to be less than 1⅝-in. gage.

Steel—⅞-in. hexagon.

Water Pressure—From Tonopah water mains. Standard pipe fittings for air and water will be used. Each contestant to make his own air and water connections.

Conditions—Each contestant must have his machine fitted with standard ¾-in. nipples for air and water. Contestants must point hole so as to avoid holes previously drilled. Failure to do so loses contest. Each contestant will be allowed one trial connection for air and water prior to drilling. Each contestant must be ready to drill within five minutes after being warned by judges. Each contestant will be allowed one coach on the rock, coach not to touch any equipment or the driller. Violations of this rule forfeit contest. Each contestant will be allowed to have representative from the company manufacturing the machine as a time inspector, to be governed by the judges' watch only. The representative will not be allowed to make any decisions nor to pass on any of the equipment.

Allotment Space—Granite block will be marked in squares and numbered, and contestants will draw for time and place on rock.

Place—Main St., Tonopah, Nev.

Entries Close—At 5 p.m., July 1. Drawing for place to be held at 7:30 p.m., July 1, at Justice of Peace Court.

Special—Any conditions arising not covered by above rules will be left to a decision of the judges of this contest.

The large purses offered, and the confidence in their ability shown by the miners, brought out thirty-nine contestants. Each of these men depended on his favorite blacksmith to sharpen his steel, and each had to decide upon the type of bit he thought would be best suited to the rock. In addition, he had to choose between the many makes of machines offered him. For days the men practiced out on the surface or underground, and each had his throng of admirers.

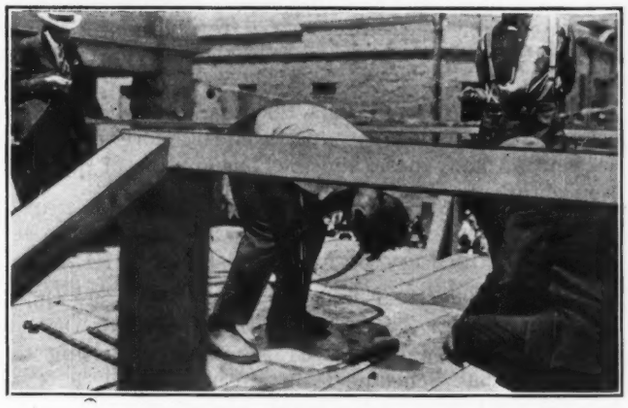
At the contest each man in his turn laid his steel at the side of his drill, put both air and water hoses close to the machine and pipe connections, and at the word "Go!" connected up his machine first, sprang to his pipe connections, connected them, using hand-pressure only; turned on air and water, jumped back to his machine, put in his starter, stuck it between his toes, and, leaning over the machine, turned on the air.

A few of the contestants used longer steel and kept their machines up nearly breast high, but the best drillers used short steel, rode their machines, and drilled down to the shank on each steel. A few used only three steels, but the winners used four, ranging from a short starter to a final 6-ft. steel. Two or three men used the steel holder on each steel, but most of the drillers used it only in an emergency. A few left it off the drill entirely, assuming that if a steel stuck they would lose anyway.

The favorite bit was the single bit, ranging from the Carr bit to many variations, which applied to the cutting angle, cutting edge, and the position of the

water hole. The choice of machine was influenced a great deal by the agents of the drills, some of whom, it is said, paid the entrance fees and even offered additional rewards to purse winners. This action is to be regretted, as it places too much emphasis on the make of the drill and not enough on the men behind the drill.

The contest is essentially a test of skill between miners. The depth of hole drilled in the 7 minutes by the men varied from $27\frac{5}{16}$ to $56\frac{5}{8}$ in., with one man entirely out of the race because he stuck a drill beyond recovery; another because a steel broke in the hole; another because his coach touched the water valve, another because his blacksmith forgot to temper one of his drills. Two other drillers were making excellent records, when, in one case, a drill shank broke, and, in another, the machine-water hose broke. Another twisted himself and his hoses up in a bad tangle trying to get his long drill to rotate.



SCENES AT TONOPAH DRILLING CONTEST

That the records with the same drill varied greatly is shown by the fact that the high and low record made with one type was $45\frac{5}{16}$ in. and $27\frac{5}{16}$ in.; with another $56\frac{5}{8}$ in. and $32\frac{5}{8}$ in.; with a third $47\frac{5}{16}$ and $28\frac{3}{16}$ in.; with a fourth 49 $\frac{14}{16}$ in. and $36\frac{12}{16}$ in.; and with a fifth $44\frac{11}{16}$ in. and $44\frac{6}{16}$ in. The highest two records were made with the Cochise No. 39 drill. This drill had an advantage, as it has a $2\frac{7}{16}$-in. piston bore, compared with the $2\frac{1}{4}$ in. of all the other makes, except the Chicago Pneumatic, which is $2\frac{3}{16}$ in. The other firms had jack-hammers with over $2\frac{1}{4}$-in. bore, but they weighed over the 50 lb. maximum of the contest. The lightest drill was the Sullivan, with a weight of 38 lb.

The winner of the contest was Dan Boyd, an experienced miner employed in shaft sinking at the Divide Consolidated, in the Divide district. It took him only 22 seconds to connect his hoses and start drilling. He drove each steel down to the collar and made his changes of steel in from 6 to 8 seconds. His record for the 7 minutes was $56\frac{10}{16}$ in., which gave for the actual drilling time of $6\frac{1}{4}$ minutes a drilling speed of 9.07 in. per minute.

The average time to get started was about 40 seconds, with a maximum of over a minute. The average time to change a steel was 10 seconds, with a maximum of 18 seconds. Boyd exceeded the average man by 18 seconds in getting started to drill, and in his drill changes, or a drilling equivalent of $3\frac{5}{8}$ in. He exceeded George Lynch, the winner of second money, by over this amount, showing that his drilling time was also the fastest. The winners of the purses were:

First—Dan Boyd, of the Divide Consolidated, $56\frac{10}{16}$ in., Cochise machine, crossbit.

Second—George Lynch, of the MacNamara Crescent, $52\frac{2}{16}$ in., Cochise machine, crossbit.

Third—Adam Ogi, of the Montana Tonopah, $49\frac{14}{16}$ in., Sullivan machine, single bit.

Fourth—Ed Yender, of the Gypsy Queen, $48\frac{8}{16}$ in., Sullivan machine, single bit.

Many of the spectators complained that the contest was not as interesting as the old double-hand contests. There is not the spell that binds one in watching a powerful man striking rapid accurate blows upon the head of a small steel that another man grips and churns without a blink of an eye at the flashing hammer. However, the day of the double-jack is gone in modern mining, and it is no longer a representative contest between the miners of the district. The jack-hammer contest brings out contestants from nearly every mine, and is a contest that appeals to every miner and mucker in the district. The excited comments of "Change your drill!" "Ride it hard!" "More water!" and "Blast it out!" show the spirit that surrounds the drilling platform.

Intense Interest Displayed by Spectators

The betting spirit of the miners was manifest. Odds of thirty to one were posted at first against any single entry, but gradually the odds grew less on the favorites. The interest toward the end of the contest resembled the finish of an exciting race. In this contest the last man to drill won the contest.

The man who won the first contest two years ago was a Finn, who used the same Ingersoll machine that the others used, but, for his steel, just picked his pieces from those ready to go down in the Belmont mine. He drilled 61 in. in the 8 minutes given. This year, to keep from drilling through the rock, the time was cut to 7 minutes. If this year's winner had been given 8 minutes, he would have considerably exceeded the 1917 record.

The contest was in every way a success, and it greatly stimulates the interest of the miners in the work and knowledge of drilling with jack-hammers. Fourth of July and Labor Day celebrations in mining camps should always have contests to try out the skill of the miners in their own line of work. It causes much useful discussion of drilling for months afterward, both in the bunkhouse and down in the mine while "taking five."

This article has dealt at length with the conditions governing the jack-hammer contest at Tonopah, with details of the contest, in order to give information of value to celebration committees in other camps.

To Drill Gold-Placer Ground in Dutch And French Guiana

Further Investigation To Be Made of Property Along The Moroni River Held Under Concession From the French Government

AN EXPEDITION sailed on July 30 on the S. S. "Prince der Nederlander," of the Royal Dutch West India Mail S. S. Co., for Dutch Guiana, to prospect gold-placer ground, held under concession from the French government, along the Moroni River, the boundary line between French and Dutch Guiana. It is reported that the deposit is 200 miles inland, and the river is not navigable by steamer for that distance.

A preliminary inspection of the ground was made about one year ago by W. S. Gage, and the present party expects to drill the ground in order to block out sufficient yardage for dredging operations. The work will be performed with an Empire drill. One 85-ft. motor-driven yacht, formerly a submarine chaser, to be used for navigating the shallow river, is a part of the equipment.

The party was in charge of Perry Tiffany, with M. J. I. Page as assistant. The remaining personnel consisted of Edmund V. Gillespie, E. Barnett, James W. Coulter, F. J. Canavan, and William Adams, a topographical surveyor. J. F. Van Name, of R. T. Wilson & Co., 120 Broadway, New York, is one of the officers of the company, which is known as the Liberty Development Co. The headquarters of the party will be at Paramaribo, one of the principal ports of Dutch Guiana.

Opportunities for the Marketing Of Manganese Ores

Those of High Grade Find Application in Several Lines Other Than Steel Making—Dry-Cell Manufacture of Importance

NOW that manganese is happily no longer required for war purposes, domestic producers of ores of this metal must find other outlets for their product. The U. S. Bureau of Mines is preparing a bulletin on manganese, a part of which, devoted to the uses of this metal other than for steel making, has already been published in mimeographed form.

The market absorbs about 50,000 tons of manganese ore per annum in addition to that used in steel. Most of this ore is the highest grade of pyrolusite, generally spoken of as chemical manganese ore, and so commands a much higher price than the lower grades used for metallurgical purposes. Before the war, most of it was imported from Russia, Saxony, Japan, and Nova Scotia, but in the last few years some excellent domestic properties have been developed. Some of the more important uses discussed are:

Dry Cells—The modern dry cell consists of a sheet-zinc container forming the negative pole, lined with absorbent paper to keep the zinc moistened with the electrolyte, while preventing contact with any solid particles. A carbon electrode forms the center of the cell. The space between the paper and the carbon rod is then filled with the depolarizing mass called "mix." This consists of ammonium chloride, which is the electrolyte; ground graphite and coke, to render the "mix" more conductive; zinc chloride, to combine with the ammonia liberated when the cell is in use; and manganese ore, to furnish oxygen for the hydrogen produced; the reaction being

$$Zn + 2NH_4Cl = ZnCl_2 + 2NH_3 + 2H$$

The manganese ore for this purpose should preferably contain 80 to 85 per cent MnO_2 and less than 1 per cent iron, with practically no copper, nickel, cobalt, or arsenic. Lower-grade ores have been used during the war, with good results, however, so that any ore running over 70 per cent MnO_2 may possibly find a market for the purpose named. The higher grades are still required for the manufacture of flashlight batteries.

Ceramics—A slight amount of iron in the form of ferrous silicate gives a green tint to glass. This is most commonly neutralized by the addition of a small amount of manganese ore, the quality required being about the same as for dry-cell manufacture. From two to fifteen pounds of ore is required per 1,000 pounds of sand. The addition of more manganese results in an amethyst tint, and if as much as 3 per cent is added, a black glass, such as is used for ornamental purposes, is produced.

Paint—Manganese dioxide and salts prepared therefrom are extensively used as driers in mixtures of linseed or other oils. The action is probably catalytic.

Miscellaneous Chemicals—Manganese chloride is used for dyeing cloth a brown or bronze. The sulphate finds a market for calico printing, porcelain painting, and as a drier. The persulphate is an oxidizing agent in the manufacture of organic products. Permanganate of potash is used in treating wood, for bleaching textile fibers, for disinfecting, and for purifying various gases.

Manganese Bronze—This term is somewhat a misnomer, as the alloy does not contain more than 0.05 per cent of manganese, and the consumption of manganese for this purpose is, in consequence, small.

Chronology of Mining, July, 1919

July 1—Cornerstone laid for new U. S. Assay Office, New York.—War Trade Board transferred to Department of State.—Consolidated Mining & Smelting Co. of Canada put Schedule C in effect at Trail, B. C.—New Mexican mining law went into effect.

July 6—Downtown pay office of Anaconda company dynamited in Butte, Mont.

July 7—Calumet & Hecla and subsidiaries announced that all underground men will be re-employed.

July 8—Conference took place in Butte, Mont., between mining-company officials and union representatives.

July 10—New suits brought at Bisbee, Ariz., for deportations on July 12, 1917.

July 12—Northwest extension Burkburnett oil field shut down for five days by Texas Railroad Commission to avoid overproduction.—Steel workers' unions at Washington meeting recommend that strike vote be taken.

July 14—Weimar dispatch stated German potash syndicate had asked permission of government to raise price of potash 100 per cent, owing to increased production cost.

July 15—War Trade Board announced that nitrates of soda and potash, also tin ore and tin concentrates

may be imported freely under general import license.—Calumet & Hecla and Mohawk-Wolverine mining companies raised wages 15 per cent.

July 16—Wages increased in Warren district, Arizona, for copper miners, also for smeltery employees at Douglas.—War-time wage scale restored at mines in Coeur d'Alenes, Idaho.

July 17—Hearings on war-mineral tariff bills postponed until September by House Committee on Ways and Means.—C. E. Lescher, of U. S. Geological Survey, told Rules Committee of House that big coal shortage confronts Eastern and Northwestern sections of United States.

July 21—New freight rates effective on ore and concentrates shipped from Boulder and adjoining counties, Colorado, to Pueblo smeltery.

July 23—Miners struck at Cobalt for recognition of union.—Anaconda abolished sliding scale and raised wages of union employees $1 per day, effective for year beginning July 1, 1919.—Announced that Mexican government will permit temporary boring of oil wells provided companies will submit to possible future legislation.

July 28.—Tungsten tariff bill reported favorably to House.

July 30—Calumet & Hecla presented medals to employees for long service.

Bauxite Lands in British and Dutch Guiana

The restrictions on taking up bauxite lands in British and Dutch Guiana have not been removed in either colony, according to a recent consular report. In British Guiana prospecting licenses are still issued and persons are allowed to prospect for bauxite and enter applications for the lease of crown lands, but there is no certainty that leases will be granted for the lands prospected. Acting under instructions of the British government, the colonial government has granted no leases for bauxite lands during the last two years, and at present it is impossible to obtain any information as to the British government's intention.

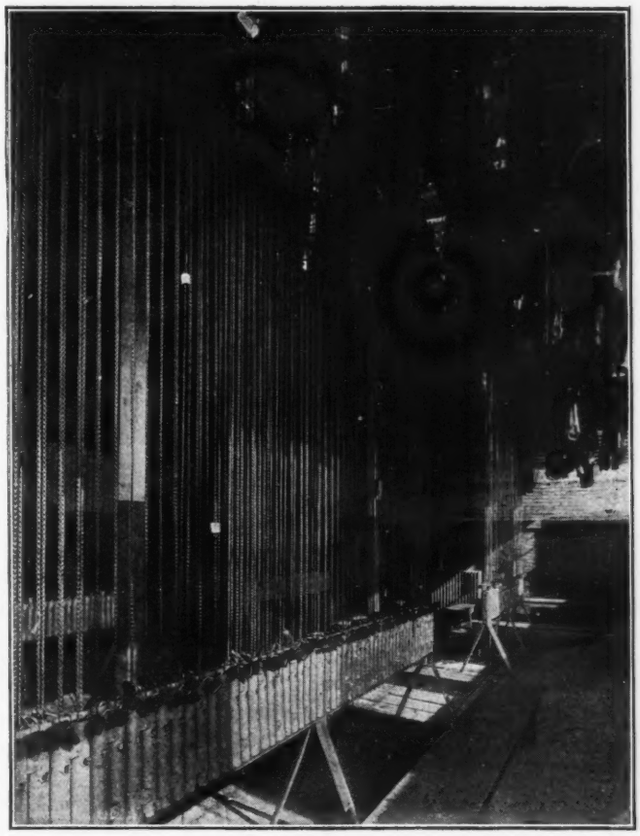
The Demerara Bauxite Co., Ltd., an American concern with offices in Philadelphia, Pa., puchased private lands containing bauxite, and in addition to these tracts secured leases from the government for about 2,500 acres of crown land containing bauxite. This occurred more than two years ago, or before the British government directed that no more leases be granted, and it is believed comprises all bauxite lands leased up to the present time.

In Dutch Guiana leases have been granted for about 125,000 acres of bauxite lands. These leases were granted under the old mining laws, but in March, 1918, a bauxite ordinance was passed by the Dutch Guiana government and the issuing of licenses under the old law discontinued. This new ordinance has not yet been approved by the Dutch government in its original form, but it is understood that the colonial government has been advised recently that it has been approved with certain changes. Pending the passing and approval of this ordinance, all prospecting for bauxite was stopped, and no leases were granted, and it is not now known when the restrictions will be removed.

There is no information available as to the estimated area of bauxite lands in either colony, as all prospecting has been done by private interests.

Overhead Hanging Arrangement For Clothes

A simple and sanitary arrangement possessing special advantages in the solution of the clothing problem in change houses is illustrated herewith. In the upper part of the picture the clothes are shown hanging suspended by a light chain, which passes over a series of pulleys and is fastened below. The arrangement also provides a convenient means for taking care of the loose chain, shown in the lower left-hand corner. The cylindrical containers are numbered so that no confusion will arise when the workman wishes to obtain his clothing. A particular feature of the installation is the provision made for the individual locking of the chains, which provides ample security against theft or other interference with the clothing during the absence of the men.



OVERHEAD HANGING ARRANGEMENT FOR CLOTHES

The advantage of having working clothes exposed to the free circulation of air which is obtained by the above method will be realized by operators who have had experience with the defects of the ordinary change house.

This illustration is reproduced from the "Bulletin" of the Bureau of Safety, Sanitation, and Welfare of the U. S. Steel Corporation, and shows the arrangement as installed by the Tennessee Coal, Iron & Railroad Co.

Mexico's New Mining Law

The last clause of Art. 17 of the new mining law of Mexico, the text of which was given in the issue of Aug. 2, should read "a single tax which shall not exceed 5 per 1,000 per annum, on the value of the property and its equipment."

BY THE WAY

An Item in the Cost of Tin

Transportation charges on six bundles of picks and handles sent during the war from New York to Jos, in the Nigerian tin fields, amounted to about $275, figuring exchange at $4.61. Jos is practically at railhead and 700 miles inland from the port of Lagos. The Railroad Administration cannct be blamed for this.

Smoke Farming

Some of our British friends are not alive to the possibilities of smoke farming. The *Ironmonger* recently called attention to protests voiced in the daily papers against the proposal to begin the manufacture of aluminum wares at Stratford-on-Avon. One protestant takes this to mean the erection of "blast furnaces and smelting factories." Even so—sentiment should not stand in the way of a community's welfare, especially the welfare of the hard-working farmer. On this side, the cloud of smelter smoke has had its silver lining for the thrifty tiller of the soil. Then again, when taxes are to be levied, the mining and metallurgical industries have proved a godsend to him.

Oil Stocks and the Movies

Oil-stock advertisements without any additional illumination seem to be bright enough to attract most of the "speculation moths," but it remained for a moving-picture firm to devise a method by the use of which stock-selling agents can surely induce the uncertain ones to part with cash for stock. "Seeing is believing; when they believe they buy; show them with moving pictures," reads part of the advertisement. A choice line of gushers, flowing wells, tank farms and refineries is offered. Think what an irresistible argument a gushing well photographically adjacent to the "X. Y. Z." ten-acre tract would be to a wavering would-be speculator in the stock of that company! The world moves; and moving pictures and stock brokers are well in advance of the main body of the procession.

Problems in Seating Capacity

The school men of the Middle Ages, it is said, were fond of debating such problems as how many angels could sit on the point of a needle. Time rolls on, and today in New York and elsewhere subway experts and others are confounding their brains with similar problems. The vexing question bobs up again in the Interior Department at Washington, where, by recent order, each employee has been restricted to 78 sq.ft. of floor space. Almost a mutiny has resulted, according to our Washington correspondent. Though this amount of space may be sufficient for stenographers and clerks, it is not sufficient for geologists and engineers. The latter, who must have space for map cases and for cabinets of specimens, as well as the usual desks, chairs, and bookcases, are certain that they cannot get along in such confinement. But everything has its compensation. What if a geologist be confined bodily within narrow limits! How fancy free he is to roam! With what mental strides he skips from Archæan time to the glacial period without even a thought of the layman at his side. Let him take similar thought with Lovelace that "stone walls do not a prison make," and perhaps even out of his confinement will come a masterpiece.

A Time Consideration

M'son, this 'ere pro'ibition be 'ard for some chaps to h'understan'," said Cap'n Dick. "May be a bloody good thing for tha country, although, min' you, I'm not speakin' my feelin's, so thee does'nt naw 'ow I stan's on tha matter. 'Owever, as I wuz sayin' befoor, I naws some chaps 'o does'nt like un, an' per'aps they 'as good reason h'after h'all. Tha h'other day Billy Penglase an' Sammy 'All wus walkin' from tha mine after shif'. Min' you, it 'ad been their custom for years to stop at 'Arry Nesbit's place an' stan' h'each h'other to a pint afor' they went 'ome. An' this time w'en they gaws by, an' sees tha ol' place closed h'up like a las' year's bird's nes', they wuz pretty much dis'eartened, Billy 'specially. So Sammy, by way o' cheerin' 'im h'up, sez, "I tell 'e, Billy, let's gaw to one o' these 'ere soda fountains an' see w'ot we can do there.' So in they gaws, an' Sammy, 'o'd been there h'often, sez, 'Ere, boy, bring me some chocolate soda and get Billy 'ere a strawberry sundae.' An' Billy, 'e starts h'up an' makes for tha door. 'W'ot's tha matter naow', sez Sammy. 'W'y, dam-me,' sez Billy, 'If I can't 'ave un naow, I don't want un. I'll be blawed if I'll wait till Sunday.'"

D. E. A. C.

A Glance Into Ancient History

The first technical book produced by any of the ten papers now published by the McGraw-Hill Co. appears to have been Dr. Edward Dyer Peters' "Modern American Methods of Copper Smelting," published in 1887. Through succeeding editions the sale reached the surprising total of 15,000 copies. Though Dr. Peters later produced two big books on the subject of copper smelting, his original work under the title of "Modern Copper Smelting" is still in print and in good demand. In 1890 came Professor Henry Marion Howe's "Metallurgy of Steel"—another classic of metallurgical literature, which remained actively in print for twenty years, and now commands high prices whenever it appears in the second-hand market. It was reprinted from the type pages of the *Engineering and Mining Journal.*

The *Journal* under the guidance of Richard P. Rothwell developed a notable series of books on mining, metallurgy and geology. Among these should be mentioned Hofman's "Metallurgy of Lead," Richard's "Ore Dressing," Ingalls' "Metallurgy of Zinc and Cadmium," Campbell's "Manufacture and Properties of Iron and Steel," Kemp's "Ore Deposits of the United States and Canada" and numerous others, most of which, though fully twenty-five years old, have in various revisions held their places as standard works.

Similarly, the *Electrical World,* under the direction of W. J. Johnston, contributed some of the most important books in the literature of electrical engineering. The works of Charles P. Steinmetz, which he has loyally revised and to which he has constantly added new volumes first appeared in this regime. Again, the works of Dr. Louis Bell, Silvanus P. Thompson, and Kempster B. Miller are to be included.

Up to 1909 the book departments of the various papers had produced about 200 books. In the ten years that have elapsed, the list has grown in the hands of the McGraw-Hill Book Co. to approximately 1,000 titles.

PERSONALS

EDSON S. BASTIN, who is in charge of the mineral resources division of the U. S. Geological Survey, has accepted an appointment to the chair of economic geology in the University of Chicago. He will continue his work with the Survey until Jan. 1, after which he will enter upon his new duties.

A. D. Cox is making an examination of a placer deposit at Kirkland, Ariz.

W. A. Simkins, Lieutenant of Engineers, has returned to San Francisco from France.

Fred Hellmann passed through Reno, Nev., on July 29 after visiting the Divide district.

C. C. Van Nuys, of the Air Reduction Co., has gone to Petrolia, Tex., on professional business.

H. R. Hanley, superintendent of the Mammoth Copper Mining Co.'s zinc plant at Kennett, Cal., has resigned.

Everett H. Patterson, mining engineer now of Long Beach, Cal., has been visiting his former home in Spokane.

L. F. S. Holland will return to California early in August from Bingham Canyon, Utah, where he is making examinations.

C. A. Hoffmaster, for fifteen years purchasing agent for the Mammoth Copper Mining Co., at Kennett, Cal., resigned on Aug. 1.

A. H. Graham, recently construction engineer with the Burma Mines, Ltd., at Namtu, Burma, has returned to New York.

Donald R. MacKay, has left the Sunnyside mine at Eureka, Col., and is now at his permanent address, 766 York St., Denver, Col.

N. C. Sheridan, mining engineer of Wallace, Idaho, is now general manager of the Snake and Opportunity mines at Hillsboro, N. M.

Adolph Knopf, of the U. S. Geological Survey, arrived in Tonopah, Nev., July 26, for the purpose of making a preliminary report on the Divide district.

John H. Eggers, mining engineer of San Francisco, recently completed an extensive examination of mining property on the Mother Lode in California.

Charles F. Haselton returned from France with the 27th Engineers and will soon assume a postion with the Modoc Consolidated Mines Co., Victor, Col.

Lieutenant H. K. Bowen has returned from overseas, where he served in the R. A. F. Lieutenant Bowen will soon resume practice as a mining engineer.

Harry Donaldson, who has latterly been engaged in mining near Madoc, Ontario, has been appointed superintendent of the Beaver Consolidated mine, Cobalt.

D. McPhail, who has been in charge of operations at the Hudson Bay Mines, of Cobalt, has succeeded **C. Randall** as resident manager of the Dome Lake property, Porcupine.

John T. Reid, mining engineer of Lovelock, Nev., has recently returned to Lovelock after extended mine examination work in the Blue Mountains of northeastern Oregon.

Lieut. Col. S. R. Elliott, of the 28th Engineers, has returned to Ishpeming, Mich., and resumed his duties as assistant general manager of mines of the Cleveland-Cliffs Iron Co.

A. H. Jones, superintendent of mills of the Tonopah Belmont Development Co., has resigned to accept a position with the Butters Filter Co., with headquarters at Salt Lake City.

Photo by Harris & Ewing, Washington, D. C.
EDSON S. BASTIN

D. L. Goddard has been appointed manager of the smeltery at the Chillagoe works, in Queensland. Mr. Goddard was manager for nine years at Cloncurry under W. H. Corbould.

Charles W. Burgren was appointed assistant superintendent of the Dolores Mines of the American Smelters Securities Co. at Matehuala, S. L. P., Mexico, instead of superintendent, as previously announced.

Rene J. Mechin has resigned as engineer for the Nacozari Consolidated Copper Co. and has accepted a position in the engineering department of Cia de Santa Gertrudis, S. A., at Pachuca, Hidalgo, Mexico.

C. Lonsdale Smith has been appointed manager of the Tungsten Mines, Ltd., Frogmore, N. S. W. Mr. Smith was formerly manager of the Macdonald Kitchner molybdenite mines, Queensland, and Butler's tin mine, N. S. W.

D. M. Faries, civil and mining engineer, of Wallace, Idaho, has been appointed chief deputy of the State Highway Commissioner. He will supervise road construction in all parts of the state, making his headquarters at Boise.

Olaf P. Jenkins and **E. D. Wilson,** of the Arizona Bureau of Mines, have returned from Jerome, where they have been engaged in areal mapping and making a study of the geology of the Jerome Quadrangle and along the Verde River.

Major W. M. Henderson-Scott has been appointed to the secretaryship of the Imperial Mineral Resources Bureau in England. Major Henderson-Scott is a graduate of the Royal School of Mines and the winner of the De La Beche medal of that institution.

C. L. Larson, of Kellogg, Idaho, has accepted the position of manager of the Boston & Arkansas Mining Co., at Gillham, Ark. For the last four years Mr. Larson has been in charge of experimental work for the Bunker Hill & Sullivan company, at Kellogg.

Robert Slessor left Australia recently for Hongkong to assume a position with a British firm as consulting engineer. Mr. Slessor had been for the last fourteen years occupying a similar position with Messrs. Brandeis, Goldschmidt & Co., metal merchants.

H. W. Stotesbury has resigned his position as engineer and mine superintendent with the Tonopah Mining Co. after twelve years service and will engage in consulting business for himself. Mr. Stotesbury is temporarily in Reno, Nev., but expects to open offices in Los Angeles, Cal.

J. Parke Channing will attend an industrial conference to be held at Silver Bay, Lake George, N. Y., beginning Aug. 29. The general theme is "Human Relations and Betterment in Industry." The conference will be held under the auspices of the International Committee of Young Men's Christian Associations.

W. C. Clemons, superintendent of drilling of Beaumont district for Gulf Production Co., has been promoted to superintendent of drilling of West Columbia, Goose Creek, Humble, and nearby fields, with office in Houston. Mr. Clemons will be succeeded by **J. V. Reddick,** now field superintendent at Sour Lake.

Captain W. J. Rose, M. C., 3d Pioneer Batallion, and formerly chief metallurgist of Amalgamated Zinc, Ltd., returned to Australia via America and New Zealand by the SS. "Makura." Captain Rose is on leave and came to America in the interests of the Electrolytic Zinc Co. He has been on active service for three years.

Marshall D. Draper is chief of a mining exploration party, capitalized by a syndicate composed of Denver, New York, and Boston men, to conduct a thorough exploration of the mineral resources of southwestern China. Several American engineers joined the party in San Francisco, where they sailed for Hongkong on the "Persia Maru."

Major Charles Will Wright recently arrived in Sault Ste. Marie, Mich., with his family from Sardinia where he was managing lead-zinc mines and during the war had charge of the American Red Cross work. Major Wright intends to return to Italy in September. His present address is care of J. S. Dunstan, 42 Broadway, New York.

J. C. Farrant is the author of a series of articles being published in "The Mining Magazine" entitled "Four Years as a Prisoner of War." Mr. Farrant is at present the London representative of the Hardinge Conical Mill Co., as was announced in a recent issue of the *Journal*. He had been taken a prisoner of war and sent to Russia.

W. C. Robinson, a director of the Bureau of Oil and Natural Gas Conservation of the U. S. Food Administration, has been elected a director of the Massachusetts Oil Refining Co., recently incorporated. Mr. Robinson is also president of the Pittsburgh Pipe Line Co., vice-president of the Pittsburgh Oil Refining Co., and president of the W. C. Robinson & Co.

D. W. Kerr, through the sale of his stock in the American Zinc Products Co., Greencastle, Ind., and Fort Smith, Ark., has transferred control to the Valley Iron Co., Youngstown, Ohio. Mr. Kerr has resigned as president and is succeeded by C. W. Martin, formerly vice-president of the Deforest Sheet & Tin Plate Co., Niles, Ohio. C. C. Stewart is the new vice-president, and C. H. Stewart the new secretary. The New York offices will be continued at 50 Church St. with Marcus L. Filley as Eastern sales manager.

INDUSTRIAL NEWS

Rossendate-Reddaway Belting and Hose Co., Newark, N. J., announces the appointment of E. O. Floyd as its general sales manager to take effect Aug. 1, 1919.

Morse Bros. Machinery and Supply Co. have issued a stock list of machinery at Denver, Col., which includes all kinds of power house, milling plant, laboratory and underground equipment.

L'Eclair Building, No. 15 Boulevard des Italiens, Paris, is now in the process of completion and will be the only American type of office building in Paris. For information regarding the leasing of premises apply to Mark R. Lamb, Woolworth Building, New York.

Acieral Products Co., 25 Church St., New York, has issued a pamphlet on "Acieral", an alloy of aluminum and steel. The physical properties of this alloy and uses are listed and a table of acieral aluminum sheets giving a report of tests conducted by the Bureau of Standards, Washington, D. C., is included.

The Electric Furnace Co., Alliance, Ohio, has just shipped to the Dayton Engineering Laboratories, Dayton, Ohio, an electric furnace for melting and refining aluminum in the Delco plant. This furnace has a hearth capacity of 500 lb. and a melting rate of 200 lb. of aluminum per hour. It is equipped with a double charging door in the front and rear, and otherwise is similar to the standard Baily electric furnace of 105-kw. electrical capacity, and 1,500-lb. hearth capacity.

United Filters Corporation announces that, in addition to the present filtering equipment it is marketing, additional filter presses of the plate and frame and recessed types will be added. It is now in a position to furnish the three types of filters in general use—the pressure leaf type represented by the Kelly and Sweetland filters, the continuous suction type represented by the American filter, and the plate filter presses known as the United. Bulletin No. 50 illustrates the new filter presses and will be sent on request.

Hercules Engineering Corporation announces the following additions to the staff: Major M. G. Donk, previously associated with and in charge of government work at Midland, Mich., will undertake work of a special character on the installation of equipment. J. T. Brewster, who has acted in a consulting capacity with the corporation for the last three years, has succeeded A. H. Alberger in charge of the technical and engineering departments. Previous to his association with the corporation, Dr. Brewster was connected with the Du Pont organization.

Chas. Butters & Co., Ltd., 90 West St., New York, announces that Charles Butters, who has been acting as managing director, is no longer associated with the company. Arrangements have been completed whereby the company retains all its former business and assets intact. American offices have recently been established at 90 West St., New York, where a general business in metallurgical engineering and in the application of the company's special processes and apparatus to metallurgical and chemical problems will be conducted under the direction of F. L. Bosqui. This is the only official representation the company has in the United States at the present time.

TRADE CATALOGS

Large Power Drives. Morse Chain Co., Ithaca, N. Y.; Publication No. 14 revised, entitled "A Chain of Evidence"; 6¼ x 9; 22 pp.; illustrated. A pamphlet illustrating and describing the Morse Silent Chain and showing a few large power drives.

Mining, Quarry, and Gravel Pit Machinery, Smith Engineering Works, Milwaukee, Wis. Bulletin Nos. 261, 266; 7½ x 10½; 36 and 16 pp. respectively; illustrated. Descriptive of Telsmith primary breakers, reduction crushers, screens, elevators, conveyors, washers, and bin gates. The last pages in Bulletin 266 are devoted to blank forms to be filled in when ordering any machinery required for rock-crushing plants or gravel-washing equipment.

NEW PATENTS

U. S. patent specifications may be obtained from the Patent Office, Washington, D. C., at 5c each.

Conveying Fine Ore—Apparatus for Pneumatic Conveyance of Materials. Jens Westly, Lysaker, near Chrisitania, Norway, assignor to Sulitelma Aktiebolag, Helsingborg, Sweden. (U. S. No. 1,308,464; July 1, 1919.)

Copper-Cadmium Alloy, Method of Making. Walter C. Smith, Roselle, N. J., assignor to United States Smelting, Refining & Mining Co. (U. S. No. 1,307,642; June 24, 1919.)

Crushing—Ball Mill. John R. Ball, Durango, Col. (U. S. No. 1,307,951; June 24, 1919.)

Crushing—Ball-Mill Liner. John R. Ball, Durango, Col. (U. S. No. 1,307,952; June 24, 1919.)

Crushing—Roller Mill. Frank E. Marcy, Salt Lake City, Utah. (U. S. No. 1,309,210; 1,309,211; and 1,309,212; July 8, 1919.)

Drill—Percussion Rock Drill. James Fletcher, Newnes, New South Wales, Australia. (U. S. No. 1,305,349; June 3, 1919.)

Drill—Rock Drill. Wilhelm Mauss, Johannesburg, Transvaal, South Africa. (U. S. No. 1,303,705; May 13, 1919.)

Drill — Rock-Drill Hose Connection. Malcolm S. Beaton, Jeppestown, and Stewart Youngson, Johannesburg, Transvaal, South Africa. (U. S. No. 1,304,248; May 20, 1919.)

Drill. Cornelius J. Esseling, Heerlen, Netherlands. (U. S. No. 1,306,674; June 10, 1919.)

Drill-Bit-Pulling Device. William M. Williams, Tonopah, Nev., assignor of one-half to Burney Langston, Reno, Nev. (U. S. No. 1,305,184; May 27, 1919.)

Electric Heating and Melting Furnace. Victor Stobie, Dunston-upon-Tyne, England. (U. S. No. 1,305,177; May 27, 1919.)

Fuel-Feeding Device (for Pulverized Material). Charles S. Heffelfinger, Lebanon, Pa. (U. S. No. 1,304,973; May 27, 1919.)

Furnaces—Pre-Heating Apparatus for Furnaces. Horace E. Smythe, Pittsburgh, Pa., assignor to the S. R. Smythe Co., Pittsburgh, Pa. (U. S. No. 1,305,176; May 27, 1919.)

Furnace-Charging Apparatus. William E. Moore, Pittsburgh, Pa. (U. S. No. 1,304,351; May 20, 1919.)

Ingot Tongs. Angus A. Hanlan, Gary, Ind. (U. S. No. 1,306,255; June 10, 1919.)

Locomotive—Storage-Battery Locomotive. Raymond Mancha and Joseph Teipel, St. Louis, Mo., assignors to Mancha Storage Battery Locomotive Co., St. Louis, Mo. (U. S. No. 1,306,371; June 10, 1919.)

EDITORIAL CORRESPONDENCE

Current Events and Topics in Brief of Interest to Engineers and Operators

SAN FRANCISCO, CAL.—July 30

A Wage Increase of 50c a day has been announced by the Bully Hill Mining Co., of Shasta County, Cal., effective immediately. This raises the wages for miners from $4 to $4.50 per day and for muckers from $3.50 to $4 per day. These are the highest wages paid on the Shasta County copper belt, and are a little higher than wages now paid in the Grass Valley district.

Comstock Northend Mines, at Virginia City, Nev., for the two weeks ending July 26, produced a total of 1,128 tons, valued at $32,000. Of this Consolidated Virginia produced 614 tons, which contained $13,200, and Ophir 496 tons, valued at $18,800. A noticeable feature of the conditions at the mines is the high-grade character of the ore coming from the Ophir. Fourteen bars of bullion were shipped to the San Francisco mint.

A New Schedule of Rates for electric power for gold-dredging purposes has been fixed by the Railroad Commission to be charged by the California-Oregon Power Co., and is as follows: First 50,000 kw.-hr. per meter per month, 1c. per kw.-hr.; next 50,000 kw.-hr. per meter per month, 0.9c. per kw.-hr.; all over 100,000 kw.-hr. per meter per month, 0.7c. per kw.-hr. These rates apply in all California territory served by the company and are for all installations of 300 hp. or over.

California Oil Fields in June produced 8,485,152 bbl., an average of 282,838 per day. This makes a total production for the first six months of 1919 of 50,903,451 bbl., a daily average of 281,236, and increase of 2,617 bbl. per day over the production for the corresponding period of 1918. Shipments for June were 7,712,455 bbl. a daily average of 257,082. Shipments for the first six months of 1919 averaged 275,431 bbl. per day, compared with a daily average of 292,153 in the first six months of 1918, a decrease of 16,722 daily for 1919.

In the oil fields of the state activity is noticeable in every section, with many companies busy on proved territory or wildcatting. Some of the oldest and most conservative oil companies in the state are even leading the wildcat work and are meeting with success. In southern California more than fifty oil companies are at work. In the Midway, Sunset and Kern River fields much new work is being planned, and the Standard, in the Elk Hills and near the Kern River field, is increasing its drilling operations. In many localities where wells were drilled several years ago and abandoned. operators are going back and trying again with more up-to-date equipment and sinking deeper holes. The wells recently drilled in the Elks Hills by the Standard are maintaining output, and in the south some of the big wells are making large production. Near Santa Maria, in Cat Canyon, on land leased by the Palmer Union, a gusher came in recently, spreading a pool of heavy black oil hundreds of feet wide on the surrounding land. This well was the Standard No. 1, which yielded at the rate of 15,000 barrels a day after being shot. It required eight hours of hard work to cap the well.

Amendments to the Workman's Compensation, Insurance and Safety Act, as adopted by the last California Legislature, became effective July 22, 1919, and are as follows: Compensation will be payable to the injured man on the eighth day after he leaves work as the result of an industrial injury, instead of the eleventh day, as heretofore. When an employee under sixteen years of age is injured, it shall be the presumption that such injury was not caused by serious and wilful misconduct. Serious and wilful misconduct cannot be charged against the injured employee by the employer if the injury is caused by the failure of the employer to comply with any provisions of law or any safety order of the commission with reference to the safety of places of employment. In claims of serious and wilful misconduct made against the employer, the general superintendent is made responsible for the corporation, as well as the executive or managing officer. Non-resident aliens are required to prove their dependency and cannot be conclusively presumed to be dependent. Applications for adjustments of controversies may be filed with the Industrial Accident Commission by the attorney or other representative of the injured employee, if authorized to do so in writing. A lien against compensation will be permitted for the support of dependents, as well as for the living expenses of the employee. Self-insurers shall not be required to pay any sums into the State Compensation Insurance Fund to cover liability for compensation, excepting in life-pension cases. It is a misdemeanor not to report forthwith a fatal industrial injury, by either telephone or telegraph, to the Industrial Accident Commission. An injunction may be issued against an unsafe place of employment, if it constitutes a serious menance to employees, provided that such application for an injuction comes from the Industrial Accident Commission or a member of the commission. Chapter 183 creates a liability on the part of the employers or their insurance carriers in addition to any liability heretofore fixed by law, in case of the death of an employee who leaves no dependents. Under such conditions it is required that a death benefit of $350 be paid, and the Industrial Accident Commission is authorized to draw upon the fund created for the promotion of re-education and rehabilitation of persons disabled in industry in California. This new law was passed in response to a public demand that crippled men be aided in acquiring new occupations. It will reduce dependency and prove of material benefit to the citizens of the state.

GRASS VALLEY, CAL. — July 31

Mine Workers' Protective League on July 26 voted to ratify the agreement under which the miners in the Grass Valley district, who struck in June, returned to work on June 30. This agreement is to run until July 1, 1920, and may be suspended by either side upon due notice.

PHOENIX, ARIZ.—Aug. 1

The Basic Wage Scale of Arizona miners has been raised 75c. a day, anticipating a 24c. market for copper, under a decision reached at a late meeting of the Arizon Chapter of the American Mining Congress. Mechanics and machine men have been given extra pay beyond this flat increase. The basic pay for miners will be $5.65 a day. A small degree of labor trouble has been known at Miami, where I. W. W. agitators tried to start a movement for $6 a day for six hours' work. The leader was jailed as a vagrant and the movement died.

SPOKANE, WASH.—July 31

Francis A. Thomson, dean of the School of Mines of the University of Idaho, has announced that during this summer the newly created State Bureau of Mines and Geology will survey a tract fifteen miles square in the Seven Devils copper district, in central Idaho. This work will be done in conjunction with the U. S. Geological Survey. Professor D. C. Livingston, of the University, will be in charge. A specialist in contact metamorphic deposits will be detailed for the work.

The War Minerals Relief Commission will be in Spokane about Aug. 15. The principal hearing in Spokane will be in regard to the claims of the Tri-State Chrome Co., formed during the war, of which J. D. Sherwood, Walter J. Nichols, and A. L. White, all of Spokane, are the principal stockholders. This company remodeled the old Prairie Diggings gold mill, near Canyon City, Ore., in the Grant County chrome area, and operated for a short time before the bottom fell out of the chrome market.

WALLACE, IDAHO—July 31

The Attitude of the Unions in the Coeur d'Alene district has been affected by the success of the unions at Butte in securing all their demands from the mining companies. Up to that time they had been satisfied with demanding an increase of 50c. per day, eight hours "from portal to portal" and recognition of the union. The increase of 50c. per day was allowed though not in response to the demand of the union. About the same time an advance of $1 per day was allowed at Butte, making the scale 50c. per day more than in the Coeur d'Alenes, a difference that has always prevailed and which is regarded as justified owing to the difference in working conditions. But it appears that this difference is no longer to be recognized, for Coeur d'Alene operators are now asked for another raise of 50c. per day, making the rate $5.75, and, in addition to the two other demands, they are also asked to allow time and a half for overtime and double time for Sundays and holidays, these having been conceded in Butte. These additional demands have not been formally presented, but at a mass meeting of the unions in Wallace on July 27 the chief spokesman stated that every concession granted at Butte would be demanded in the Coeur d'Alenes. As the operators have refused to confer with union representatives or to recognize the union in any manner, the unions have called a referendum on the question of striking.

SALT LAKE CITY, UTAH—July 31

The Assessed Valuation of mining property in Juab County, which includes most of the Tintic district, according to the State Board of Equalization, is $5,990,107, this being more than one-third of the total assessed valuation of property in the county, which is $17,050,425.

Wages at the Utah Copper Mine in Bingham Canyon, where operating conditions require a large number of surface workers, have been increased, according to announcement, so that all day labor paid more than $3.25 a day receives an advance of 75c. per day, and all day labor receiving $3.25 a day or less, 70c. per day, the increase being effective July 16. In regard to the above changes in the wage scale, R. C. Gemmell, general manager of the Utah Copper Co., is quoted as saying: "The advance announced is a recognition of the continued high cost of living, the principle of a living wage, an improved copper market, as well as an effort on the part of the management to demonstrate its appreciation of the attitude of its loyal employees at the time of the reduction in wages made last February, which reduction was necessitated by the stagnation of the copper market at that time. Since then a considerable improvement in the copper market has occurred, and it is hoped that it will continue, but the advance in wages now announced is based more on a belief in a better market in the future rather than upon present conditions. The present market conditions do not justify the increase now made. It is true that the copper quotations in the daily papers have recently shown an advancing price, but according to the information I have, these quotations apply to small sales of spot copper and not to any appreciable quantity that would absorb even present production. As an illustration, our production for June (and it should be borne in mind that we are operating on a 50 per cent basis) was approximately 9,000,000 lb. Our net sales for that month totaled about 4,100,000 lb. and, therefore, it is apparent that they were less than 50 per cent of production and but 25 per cent of our capacity. The average price we realized from these sales during June was a trifle less than 16.5c. per lb. Moreover, this is not all, because on June 30, 1919, we had on hand a very large amount of unsold copper."

DENVER, COLO.—July 31

Boulder County Metal Association met July 28 to discuss plans for celebrating the fiftieth anniversary of the Boulder County silver-mining industry.

The State Mines Development Association, recently promoted by L. M. Brokaw, of Denver, is intended to arouse and restore public interest and confidence in mining in Colorado. To accomplish its purpose a subsidiary company is to be organized in

at least ten of the important Colorado mining districts. Thus far subsidiary companies have been formed at Leadville, Silverton, Ouray, Georgetown, Red Cliff, Buena Vista, and Aspen. A definite project will be planned in each district to secure financial support. At present the stumbling block appears to be the selection of such a definite project for each camp.

C. Barlow Willmarth, president of the Radium Ore Sampler Co., of Montrose, predicts radium ore will soon be in demand. During the war, when the price reached a maximum of $175 a milligram, European countries could not procure American radium, and were compelled to use substitutes such as mesothorium. At present radium prices are down to $80 to $100 a milligram. Despite these low prices, the following leading producers of radium ore are regularly making small shipments: Standard Chemical Co.; Cummings Chemical Co.; Radium Co. of Colorado; Colorado Radium Products Co., in Paradox Valley; American Rare Metals Co.; Chemical Products Co., at McIntyre, and Carnotite Reduction Co., at Gateway. In Paradox Valley, radium is found in carnotite ores. The increased demand for vanadium, which is obtained as a byproduct in the recovery of radium, makes possible maintenance of the present production.

Dredges in the Breckenridge District almost every season encounter heavy sulphides of zinc and lead ore in the stream beds. Recently the dredge of the French Guich Dredging Co., operating about three miles east of Breckenridge, struck some heavy sulphide ore in the bed of the stream, on the Emilie placer. The material which was scooped up was so unusually heavy that it completely filled up the riffles of the sluices aboard the dredge. The superintendent, Trevor Thomas, had to change the course of the boat to prevent the loss of gold. He marked the spot where the sulphide ore material was found and notified Mark Evans, manager of the company. The latter has organized a prospecting and developing syndicate to explore and operate the bed-rock veins encountered in the placer beds. Associated with him are E. R. Winn and D. A. Fairbanks, of the American Harvester Co., of Chicago; T. I. Crane, of Philadelphia, and W. P. Hamon, gold-dredge operator of San Francisco. The syndicate purposes to sink a number of prospect shafts to bed rock on several of the known veins which have been disclosed by dredging operations, and by necessary drifting and bed-rock tunneling endeavor to ascertain the most promising ore-shoots before sinking working shafts.

LEAD, S. D.—July 31

The Discovery of Geologic Structure favorable to the occurrence of oil near Fairburn, S. D., has caused much activity in the vicinity. Several concerns have obtained leases on lands and are preparing to begin drilling. The Roxana Oil Co., with headquarters at Cheyenne, Wyo., was the first to enter the field, and has secured a large acreage, on which drilling will be started as soon as rigs can be brought in. Others of the larger Wyoming operators have scouts in the field, and all favorable ground is being taken. This is an entirely new field, and drilling will be rushed to determine the depth to oil.

AUSTIN, TEX.—July 31

The Texas Railroad Commission has no authority, according to a decision of the Attorney General, handed down to the commission, to close down oil wells, under the terms of the Oil and Gas Conservation Act, on account of overproduction. This decision indicates that the commission exceeded its authority in stopping production in the northwest extension of the Burkburnett field for a period of five days recently.

New Oil and Gas Conservation Rules have been adopted by the Texas Railroad Commission, and will soon be issued. The rules conform closely to the temporary rules adopted a few weeks ago. The commission has decided to issue rules and rates for pipe line companies, as agreed upon at a recent hearing. The only point left at issue at the close of this hearing was the amount of deduction from the strapping of tanks. This has later been fixed at 1 per cent for coastal fields, and 2 per cent for north Texas fields.

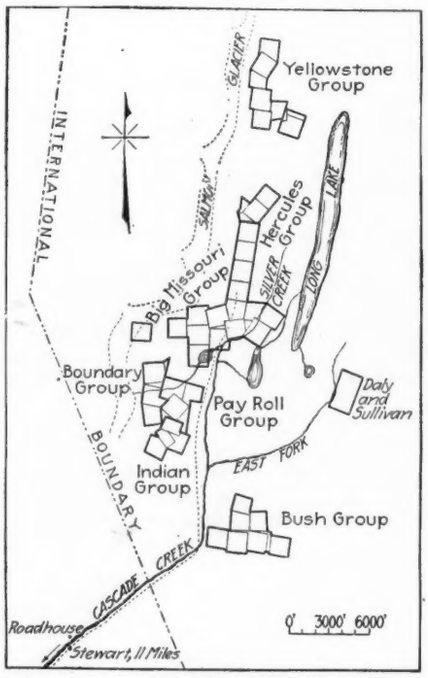
The Texas Company is restrained from drilling for oil or gas or other minerals, according to an injunction issued July 23 by District Judge Calhoun, upon a strip of land in Eastland County claimed by the Humble Oil & Refining Co. to be under lease to it by the state. Re-survey of a tract of land purchased by the Texas Co. showed an excess in acreage in the form of a strip about 240 ft. wide and two miles long. This was filed on by Eugene Giraud, of Austin, who secured a mineral lease from the state, and later sold it to the Humble company for a price reported to be $200,000. The state is defending the lease originally given to Giraud because of its far-reaching importance, there being much excess of acreage in some of the original surveys of railroad land.

MOUNTAIN HOME, ARK.—July 31

The Rising Price of Zinc is creating a little activity in the North Arkansas zinc field. A number of smaller properties are starting up, and some ore is being sold, two cars having been shipped from Zinc in July. None of the large producers are likely to start unless assured that the price of ore will remain up long enough for them to make a profit. Heretofore many of the larger operators have had smelter contracts, and if these can be had now, covering a stipulated tonnage, or the production over a certain period, all camps will become active again. Nearly all the larger mines in the field have good reserves and are in shape to make a record production. F. E. Heywood and associates, of Yellville, Ark., are considering the erection of a plant in St. Louis for making zinc chemical products from Arkansas carbonates. J. H. Haddox, of Oklahoma City, president of the Magnolia Lead & Zinc Co., which operates the Tar Kiln mine, in Zinc camp, states that the Oklahoma Ore Storage Association may build a warehouse at Zinc.

DULUTH, MINN.—July 31

All Ore-Loading Records were broken by the new No. 6 ore dock of the Duluth, Missabe & Northern R.R., on July 17, when 12,689 tons of ore was placed in cargo hold



SALMON RIVER DISTRICT, BRITISH COLUMBIA
Reproduced from Bulletin of British Columbia Department of Mines.

in 35 minutes. Sixteen men performed all the hand labor required.

The Kennedy and Meacham Mines, on the Cuyuna Range, are involved in the recent merger of the Otis Steel Co. and the Cleveland Furnace Co., both operating at Cleveland, Ohio. The new company will perpetuate the name of the Otis Steel Co., and its directorate will interlock with that of the Cleveland-Cliffs Iron Co., which has recently entered upon a period of expansion in the Lake Superior district.

Vermilion Range Iron Ores in practically all respects are the most desirable ores mined in the Lake Superior district, according to figures recently issued by the Lake Superior Iron Ore Association, which has offices in Cleveland. The report covers the period from 1902 to 1918 inclusive, and shows that Vermilion ores which average close to 58 per cent in natural iron have always ranked highest, with those of the Gogebic, Marquette, Mesabi, Menominee and Cuyuna ranges following in the order named. The highest average silica content is found on the Marquette, the highest average phosphorus on the Menominee, the highest average moisture on the Mesabi, and the lowest average of all of these on the Vermilion. The physical structure of Vermilion ore is of course unexcelled. Average analysis on the bulk shipment of 27,585,000 tons from the entire Lake Superior district in 1902 was 55.77 per cent natural iron, 0.075 per cent phosphorus, 6.23 per cent silica, and 8.71 per cent moisture. Of the 62,836,000 tons shipped in 1918, the average of the same elements was: 51.29 per cent natural iron, 0.104 per cent phosphorus, 8.12 per cent silica, and 11.29 per cent moisture. During the period covered by the report the shipments from the Lake Superior district increased 128 per cent, and shipments from the Mesabi Range alone increased 203 per cent. Bessemer ores, which constituted 65 per cent of the total shipment in 1902, had decreased to 33 per cent in 1918.

ASHLAND, WIS.—Aug. 2

All Workers on the Ore Docks at Ashland, Wis., owned by the Chicago & Northwestern Ry. walked out on Aug. 1, demanding a 33⅓ per cent increase in wages and time and a half for overtime. At most of the mines on the range, trestles are being erected so that ore hoisted can be put on stockpiles. Enough railroad cars were on hand to hold one or two days' hoist, but are now full. An effort will be made by dock officials to settle the strike promptly.

ISHPEMING, MICH.—Aug. 2

No Labor Surplus exists on any of the iron ranges in Michigan, despite the fact that all returned soldiers seeking employment have been given places at the mines in this field. On the Menominee Range, where a number of the mines are idle, workers are scarce, and operators believe that they would experience difficulty in getting men if orders were received now to operate at full force. The ore movement is about the same as it has been for several weeks, no increase in shipments being noticeable, so it is impossible to state just now what the winter will bring. There is still time to clean up many of the ore piles, but the mining business is certain to experience retardation if the demand for iron ore does not show improvement by September.

VICTORIA, B. C.—July 31

Efforts to Finance a Railroad to be built from Portland Canal to the mines of the Salmon River district, in British Columbia, are being made. Charles F. Caldwell, of Kaslo, B. C., and Spokane, is president of a company incorporated in Washington and to be known as the Portland Canal Rail & Terminal Co. Preliminary surveys already have been made and plans filed at Juneau. Mr. Caldwell hopes the road will be completed to the boundary line during the coming winter. Ore can then be shipped out from the Premier, Missouri Group, Forty-nine, Little John, Bush, Yellowstone, New Alaska, International, and other properties which are rapidly acquiring importance. Ore from these properties will be shipped to the new railroad by tramway and sleighs, until an extension of the road is built on the British Columbia side of the boundary.

TORONTO, ONT.—Aug. 2

Strike Situation at Cobalt remains unchanged, with no indications of any immediate settlement. The lower levels of some mines contain considerable water, though the flooding process in most cases is comparatively slow. The mine managers, though remaining firm in their decision not to recognize the union, state that if the men of each mine will organize committees independent of the union they will be given opportunities to discuss matters with their respective managers, as was the custom before the strike. A number of the strikers have left the camp. One result of the strike has been to give a stimulus to development in the Gowganda district, where many of the men have gone. Some of the companies whose properties at Cobalt are closed down are now devoting their attention to Gowganda prospects.

QUEBEC, QUE.—Aug. 2

Production of Asbestos in Quebec in 1918, according to the report of the Bureau of Mines of the province for the year, exceeded that of any previous year, both in quantity and value. Asbestos in the shape of "crude" and "mill stock" was shipped to the amount of 142,375 tons, valued at $9,019,899, in addition to 16,850 tons of asbestic, a byproduct of low price, making a total tonnage of 159,225 tons, of the value of $9,053,945. As compared with the figures for 1917, 154,452 tons, valued at $7,240,697, this shows an increase of 3 per cent in quantity and 24.5 per cent in value. Returns were received from thirteen producers operating eighteen mines.

THE MINING NEWS

Progress of Mining Operations Condensed and Classified for Easy Reference

ARIZONA

Cochise County

PHELPS DODGE (Bisbee)—July production of copper from Phelps Dodge smelteries as follows: Copper Queen branch, 5,011,000 lb.; Moctezuma Copper Co., 2,516,000; Burro Mountain branch, 530,000; custom ore, 337,000; total at Douglas smeltery, 8,394,000. Detroit branch (Morenci, Ariz.) produced 1,361,075 lb.

SHATTUCK-ARIZONA (Bisbee)—Large orebody cut on 1,700 level of Denn. Management will install larger pumps for prospecting on 1,800 level.

Pima County

NEW CORNELIA (Ajo)—New flotation test mill about complete.

SILVER BELL (Silver Bell)—American Smelting & Refining Co. to resume production. Ores to be sent to company's Hayden smeltery, to which El Tiro is also shipping. Sasco smeltery will not be operated at present.

NARRAGANSETT (Tucson)—Company defendant in foreclosure suit brought by Albert Steinfeld & Co. on four notes aggregating $300,000. Property consists of sixteen claims in Helvetia district. Inactive lately.

SILVER VIRGIN (Tucson)—J. J. Adair, superintendent, reports development of 10,000 tons of ore averaging above $56.

Pinal County

POLAND COPPER (Ray)—Shaft down 350 ft., with 50 ft. more to go before crosscutting begins. Extensive development planned for 400 level.

Santa Cruz County

BACA FLOAT GRANT mines to have concentrator for handling low-grade copper and silver ores developed.

Yavapai County

DUNDEE-ARIZONA (Jerome)—Opened new residential addition to Jerome on its property.

U. V. EXTENSION (Jerome)—Report of president to stockholders on Aug. 1 states company has been making about seventy tons copper daily since June 9, when blast furnace was blown in. Smeltery shut down Feb. 13, which permitted all available mining force to be used in concreting Audrey shaft and the tunnel where necessary. This concrete work will probably be finished in ninety days. Raises have been completed to surface from 1,200 level to provide filling for stopes from surface. Crosscutting will start in about a month on 1,500 level. Will increase output when demand justifies. Necessary to build employees' houses and hospital and to pay for construction of much-needed schoolhouses at Jerome and at smeltery. On July 1 there was 17,594,000 lb. copper in transit and in hands of selling agent, mostly unsold.

BIG LEDGE (Mayer)—Purchased Good Luck group of six claims from P. E. O'Brien, E. C. Hill, and W. J. O'Brien.

PECK (Prescott)—Company has purchased Pat Dolan claims, adjoining, from R. H. Burmister. New Peck mill operating on 30,000 tons of second-class ore. J. J. Macrs in charge.

ARKANSAS

Boone County

BOO-GRA-LOO (Zinc)—Company developing Frisco tract has six headings opened, assuring steady supply for mill.

COON HOLLOW (Zinc)—Polk Kendall lease in Coon Hollow bought by J. H. Deyerle, who is cleaning up ground and starting production of hand-cobbed zinc silicate.

HARVEY MINING (Zinc)—Getting from one to two tons of hand-cobbed silicate a day with small force. Property in Coon Hollow.

RHODES-MANCHESTER (Zinc)—McCurry M. & M. Co., operators of Rhodes-Manchester zinc mine, are running new mill.

Marion County

DIXIE GIRL (Buffalo)—Good body of zinc carbonate developed. Now opening body of zinc sulphide.

KATIE AND PACE (Rush)—D. J. McCargars interests bought by H. M. Kelsall and William Harticon, of Fall River, Mass., and development resumed.

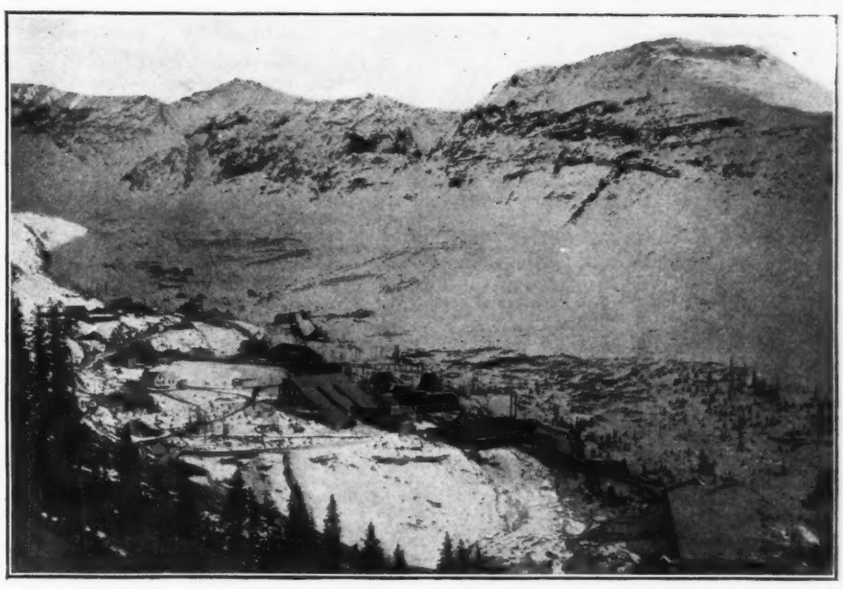
CALIFORNIA

Butte County

INDIAN SPRINGS GRAVEL (Magalia)—Preliminary work begun under management of J. Woodruff. Adjoining Hupp property will be operated through main working tunnel of Indian Springs, which is 4,000 ft. long. Litigation between these two properties has delayed operations for several years.

Inyo County

WILSHIRE BISHOP CREEK (Bishop)—Mill running two months, with average capacity of sixty tons per day giving 80 per cent extraction. Ore averages $12 per ton, and costs, inclusive of tailings loss, $6.40, leaving profit of $5.60 per ton. Reported there are 25,000 tons of ore in sight.



SAVAGE BASIN, SAN MIGUEL COUNTY, COLORADO, SHOWING MILL AND CYANIDE PLANT OF TOMBODY GOLD MINES, LTD.

Kern County

RANDSBURG DIVIDE (Randsburg)—Sale of seven-sixty-fourths interest for $50,000 reported.

Nevada County

EMPIRE (Grass Valley)—New 20-stamp addition to mill well advanced. Milling stopped at Pennsylvania mine, where mill will be dismantled when new unit is completed. Draining of mine progressing rapidly. Mine nearing normal production.

HIGHWAY GOLD (Grass Valley)—Shaft down 20 ft. Crosscut being run to cut second vein. First vein cut 2 ft. wide.

PITTSBURG GOLD FLAT (Nevada City)—Pacific Gas & Electric has instituted proceedings by means of sheriff's sale to collect debt of $2,382 incurred for power.

Plumas County

ENGELS COPPER (Engelmine)—Meeting of stockholders on Aug. 5 to vote on increase of capital stock from $2,000,000 to $5,000,000. Stated that one million new shares will be sold to strong interests at $1.50 per share, proceeds to be used to increase flotation capacity and for extensive mine developments. Engels recently examined by D. C. Jackling and engineers. E. E. Paxton general manager and John Reinmiller superintendent.

WALKER (Portola)—Flotation capacity increased to 160 tons a day by adding Marcy ball mill, Callow cones, and Dorr filter. Big drainage and haulage tunnel being driven at rate of 400 ft. a month, and now in over 1,400 ft.

Sonoma County

WESTERN QUICKSILVER (Cloverdale)—New rotary furnace giving excellent results, production for June being 197 flasks.

Trinity County

JACOBS (Junction City)—Jafet Linderberg has purchased Jacobs property on Trinity River. Has not been worked for years, on account of scarcity of water. Purchaser owns ground adjoining with sufficient water to work all property under his control.

Tuolumne County

BUCKHORN GROUP (Jacksonville)—Bonded by D. Cushman for $25,000. Development work to start immediately under J. L. Gibbs.

FORTUNA MINE (Soulsbyville)—Equipment good for considerable depth being installed.

CARLOTA (Tuolumne)—Operations will be resumed when transformers are connected. Carlota Gold Mining Co. is developing Pennsylvania mine also.

COLORADO

Lake County

C. S. DOLD (Leadville)—Company recently made promising strike on property in Poverty Flat section. Has been shipping manganese ore for several months, but recently contract expired. Before discontinuing operations, C. J. Dold, manager, decided to drift on manganese orebody on 640 level toward Pendery fault. Ore gradually changed into hard compact lead carbonate, which at present is exposed for three sets in length. Where first encountered was 8 in. wide, and at third set 4 ft. wide; 512 sacks sorted out.

IBEX (Leadville)—Annual meeting of stockholders held at offices of A. V. Hunter, president, on July 24. New directorate as follows: A. V. Hunter, J. J. Brown, Gerald

Hughes, John Campion, F. L. Smith, John A. Ewing, and J. C. Mitchell.

Montrose County

CASHIN (Paradox)—H. C. Carlton, president of Michigan Colorado Copper Co., operating Cashin mine, in Paradox Valley, expects to have first 100-ton unit of flotation mill completed within ninety days. Will build other units as output of mine warrants. Also planned to build smeltery at mine to handle flotation concentrates, instead of shipping them to Durango.

San Miguel County

SHIPMENTS FROM TELLURIDE during June were as follows: Tomboy, 60 cars of lead concentrate to Durango; Smuggler-Union, 25 cars lead concentrate to Durango and 20 cars of zinc concentrate to Blende, Col.; Liberty Bell lessees, 2 cars; and Cimarron, 2 cars; total, 109 cars. Ore produced from Argentine and Montana properties, of Tomboy Gold Mines Co., Ltd., was concentrated in Tomboy mill, in Savage Basin, shown in the illustration on preceding page

COLORADO VANADIUM (Telluride)—Dismantling and tearing down old Simmons mill to erect modern vanadium concentrator on site. Also developing properties recently acquired on Leonard Creek near Sawpit.

Summit County

AMERICAN DREDGING (Breckenridge)—Company promoted by S. L. Bright, of Chicago, and operating in upper Swan Valley, is drilling recently acquired placer ground prior to installing dredge.

IDAHO

Shoshone County

LINFOR (Enaville)—Linfor Copper Co. organized to take over Horst-Powell property on Little North Fork. Empire Copper Company built 150-ton mill and developed and shipped considerable ore while holding option on property, but failed financially. William Beaudry, formerly director and manager of Stewart property, will manage new company.

ELDORADO (Kellogg)—Crosscut nearing vein at depth of 350 ft. Upper work shows strong lead-silver vein carrying high silver.

STEWART (Kellogg)—After losing apex suit with Ontario three years ago, remaining known orebody was quickly exhausted and operations were suspended. Work recently begun to find vein east of fault.

BULLION (Wallace) — Company will prospect ground from lower tunnel with diamond drill.

NORTH BUNKER HILL (Wardner) — Preparing to sink 200 ft. further. Shaft down 300 ft. Crosscut to vein shows 6 ft. of lead-silver ore of milling grade.

MICHIGAN

Copper District

SENECA (Calumet)—Shaft down 1,842 ft. and second crosscut to start soon. Character of lode rock good wherever opened.

FRANKLIN (Demmon) — Continuing sinking with small force. Shaft now 165 ft. below 37th level. There will be no 38th level. Will cut station at 39th level. Planned to resume mining this fall if market warrants. Company has worked intermittently for 62 years.

QUINCY (Hancock) — Receiving parts for new No. 2 hoist ordered over two years ago. Erection in progress.

WINONA (Houghton)—Operations resumed, 75 men being put to work. Force will be increased as men can be secured. Two weeks required to put No. 1 and No. 4 shafts in condition for hoisting ore. Mill will also be operated. At time of shutdown flotation plant machinery had begun to arrive and building had been completed. Machinery now on ground, and will be erected without delay.

MASS CONSOLIDATED (Mass)—Wages further increased. Needs at least 200 more men. Shipping 300 tons ore daily.

MICHIGAN (Rockland)—Will be connected with railway to facilitate shipments, now handled by motor truck. Construction of new rock house progressing.

VICTORIA (Victoria)—Advertising for miners.

CHEROKEE (Winona)—May resume operations soon. Company has $20,000 in treasury and small working plant. Shaft is 450 ft. deep, being in copper rock for half this distance.

Gogebic Range

ELECTRIC LIGHT & POWER (Ashland, Wis.)—Started water-power development project on Flambeau River near Ladysmith, Wis. Power generated here will be sold to mines on Gogebic Range. Transmission line will be built from plant through Park Falls to Ironwood, Mich., and there will connect with present line, new line being about seventy-five miles long. Construction of line to be rushed so that power can be sent over it from present system and used in construction of new power plant. About 15,000 hp. can be developed, with available head of 68 ft. Company closely identified with Commonwealth Edison interests, of Chicago. Mines will furnish ready market for electric power, as it is desirable for driving pumps and compressors. This has been shown by Peninsular Power Co. on Menominee Range.

DAVIS (Ironwood)—Fatal accident occurred July 31, when laborer fell off coal dock. Dock had no handrail.

PABST (Ironwood) — Crosscut on 24th level of H shaft encountered slates of Palms formation 502 ft. north of shaft.

Marquette Range

IN CASCADE DISTRICT Isabella, Richmond, and Maitland properties are active shippers this season. Volunteer and Empire idle. Richmond and Maitland are pit mines, and ship low-grade ores. Isabella an underground mine, with ores of low and high grades.

REPUBLIC (Republic)—One of working shafts out of operation temporarily. Skip road damaged. Only one shaft can be used until repairs made.

Menominee Range

BRISTOL (Crystal Falls) — Shaft being sunk another level. Some ore shipped. Bulk of stockpile still intact.

McKINNEY STEEL (Crystal Falls) — Stockpiles being moved at Dunn and Tobin mines. All ore in stock will probably be shipped this year.

ODGERS (Crystal Falls) — Shaft concreted from collar to ledge. Sinking operations resumed. Shaft work will be hastened by raising. All ore in stock shipped.

MINNESOTA

Mesabi Range

BOURNE (Hibbing)—New property of Cleveland-Cliffs Iron Co. progressing rapidly with work preliminary to development. Planned to install two 200-hp. hoists.

HAROLD (Hibbing)—Increasing number of underground loading machines after extensive experimenting.

STEVENSON (Hibbing)—Resumed operations July 24 after two months' shutdown. Has 90,000 tons in stock, which will be shipped in addition to 60,000 tons direct from workings. Belongs to McKinney Steel Co. Formerly open pit, but now milling. Shipped 13,800,000 tons to end of 1918 season since start of operations.

ADRIATIC (Mesaba) — Shipment of stockpile begun. Underground workings remain idle. R. M. Sellwood, operator.

JULIA (Virginia)—Ownership passes from Inland Steel Co. to Julia Mining Co., subsidiary of Coates & Tweed. Property originally opened in 1900 by Franklin Rockefeller and associates, who disposed of it to Republic Iron & Steel Co., which company, in turn sold the property to Inland Steel Co.

Vermilion Range

McCOMBER (Ely) — Two-compartment shaft down 372 ft., and working in black jasper. Will be bottomed at 400 ft., and drifting north to orebody will begin. Mutual Iron Mining Co. operators.

SULLIVAN (Ely)—Algonquin Iron Ore Co. announces intention to sink shaft on this property, adjoining Chippewa mine of Chippewa Iron Mining Co., which is controlled by same interests.

MONTANA

Beaverhead County

BOSTON & MONTANA (Wise River)—Raise from 1,000 level on Idanha vein expected to hole through into upper Idanha tunnel within next two weeks. Orebody continuous thus far in raise. Ore shows in roof of Idanha tunnel and on surface.

Missoula County

POTOMAC COPPER (Potomac) — Preliminary surface work on Leonard group shows mineralized zone approximately forty feet wide.

Silver Bow County

ANACONDA COPPER (Butte)—Further efforts to develop sufficient flow of gas in northern Montana to warrant construction of pipe line to Boston & Montana smelteries abandoned after spending $250,000. Copper production in July 11,122,000 lb.; June, 10,500,000 lb.

BUTTE-BULLWHACKER (Butte)—Will resume ore shipments within ten days.

BUTTE-DULUTH (Butte) — Shipments begun to leaching plant of Anaconda company at Washoe works.

BUTTE-NEW ENGLAND (Butte)—Ore showing good on 150 level, with silver content holding up. Mining in Hesperus vein of Davis-Daly.

BUTTE & SUPERIOR (Butte)—Federal court has set Oct. 27 for hearing on accounting for damages in Minerals Separation case. Report that court had decreed damages to Minerals Separation from $15,000,000 to $20,000,000 is in error. Court also held that when more than 1 per cent of oil was used in flotation process there was no infringement of patent, and management of Butte & Superior stated company had been employing this percentage of oil and would continue using this amount. Hearing of Elm Orlu supplemental suit began Aug. 4 in Butte.

CRYSTAL COPPER (Butte)—Tong shaft down to 600 level. Carload of ore will be shipped this week. Two carloads shipped in June. Three-foot orebody cut by shaft, which will be crosscut to from 600-level station.

DAVIS-DALY (Butte)—Sinking of Colorado shaft rapidly progressing toward 2,700 level. Six veins in evidence on 2,500 level will be cut. Colorado mine now producing about 250 tons daily, which will be doubled when capacity operations are resumed. June copper production 775,600 lb., against 653,000 for May, and 31,400 oz. silver, against 25,000 for May.

NORTH BUTTE (Butte)—Production of Speculator mine being increased. Daily tonnage now over 700, compared with 450 ten days ago. Heavy tonnage of second-class ore developed on upper levels.

TUOLUMNE COPPER (Butte)—Crosscutting on 1,000 level for Spread Delight vein advancing about 100 ft. weekly. Expect to cut fissure about Sept. 1. Sinking of Sinbad shaft continued.

NEVADA

Esmeralda County

GOLDFIELD DEVELOPMENT (Goldfield)—Using 350 lb. of dynamite, 6,000 tons of ore was broken by one blast in Red Top mine on July 23, ore averaging $23.80, according to management. On July 15, 3,000 tons broken by one blast.

Elko County

BULL'S HEAD (Tobar)—Company reopening old mine in Spruce Mountain district, thirty-five miles south of Wells, and will build 50-ton smeltery. District has produced over $1,000,000.

Storey County

COMSTOCK (Virginia City)—Official report from Ophir mine of July 26 shows ore shipments for week averaged $45.92 per ton. Con. Virginia shipments for same time averaged $20.89 per ton.

Lyon County

DAYTON PLACERS (Dayton)—Bulkeley Wells and associates have acquired large acreage of placer ground near Dayton. Preparing to install large dredge. Roy Elliott will be in charge.

Nye County

DIVIDE EXTENSION (Divide)—Drifting north and south begun on foot-wall side of vein on 100 level of Caldwell shaft, where it shows 14 ft. high-grade ore. Winze also started in this foot-wall ore. Crosscut not yet reached hanging wall. Shipping regularly to West End mill ore averaging $40 per ton.

TONOPAH DIVIDE (Divide)—Shipments to mill continue at rate of 60 tons a day. Southeast drift on 580 level advanced 110 ft. and still in commercial ore. Crosscut on 370 level being driven to pick up gold vein which was original discovery on property.

CONS. SPANISH BELT (Manhattan)—In west drift from tunnel top of oreshoot found carrying principally silver, with lead and zinc. Winze will be started soon. East drift on same level in good mill ore.

TONOPAH EXTENSION (Tonopah) — Net earnings for June were $58,490 from 9,073 dry tons milled, producing 981.64 oz. gold and 104,749 oz. silver bullion. Con-

nection made between 1,760 and 1,680 level, giving better air in long crosscut.

SOUTH DAKOTA

Custer County

ARGENTINE POTASH (Burdock)—Machinery being moved to ground six miles west. Company purposes producing potash as soon as installations are completed.

Lawrence County

CUTTING (Deadwood) — Water has interfered with shaft sinking and work will be delayed until new pumps can be installed. Work being continued in main drift and good grade of ore developed.

DEADWOOD LEAD & ZINC (Deadwood) —Motors arrived and being placed in position. Plant will be placed in operation in short time, and with ore developed should be able to run continuously.

MOGUL (Terry) — Several ore verticals are being opened in Ofer-Mogul tunnel, and good tonnage being sent to mill from this source. Other parts of mine being worked at normal capacity.

TEXAS

Brazoria County

WEST COLUMBIA PRODUCTION third week in July averaged 26,000 bbl. per day. Producing companies: Crown Oil Refining Co., 10,000 bbl.; Gulf Production Co., 2,000 bbl.; Humble Oil & Refining Co., 6,500 bbl.; Hannicker Co., 35 bbl.; Sun Co., 450 bbl.; Texas Co., 7,000 bbl.

CROWN OIL & REFINING (West Columbia)—Marmion No. 3 well came in July 18 at 3,060 ft., making large production of high-gravity oil.

GULF PRODUCTION (West Columbia) —No. 1 McMeans well, over 3,300 ft. deep, spraying large quantity of oil with drill stem stuck in hole. Oil of high gravity; other oils of district lighter.

Goliad County

DRILLING TO BEGIN on Eckhardt land one mile south of Goliad. Men and materials on hand.

Harris County

GOOSE CREEK COMPLETIONS recently as follows: Joint well of Crown and Gulf Coast companies, No. 4 Gaillard, pumping; Gulf Production Co., No. 15 Stateland, testing; Atlantic Oil & Production Co., No. 1 well, testing; E. F. Simms Co., No. 24 Smith, testing, and No. 5 Schilling, pumping; Humble Co., No. 6 Beaumont, will pump soon.

BRAZOS OIL & REDUCTION (Humble) —No. 5 Fuller well came in as small pumper.

F. D. GEORGE CO. (Humble) — Took over Mennis & Horn lease recently. Several wells cleaned out and production increased from 30 to 114 bbl. daily.

PETROLEUM REFINING (Humble)— No. 30 Stevenson well cleaned out, and now making fair production on pump.

Howard County

DEEP DRILLING near Big Springs will be done by L. C. House, independent operator.

Lampasas County

NELMS-MARVIN No. 2 Well, on McCrae ranch, now down 900 ft. Passed through shallow oil sand at 800 ft.

SMITH NO. 1 WELL, on Smith ranch, has derrick built and is waiting arrival of rig. Several other wells in district will be drilled when rigs are obtainable.

TILBURY OIL (Lampasas)—Douglas No. 1 well down 400 ft. Standard rig being substituted for Star rig, and deeper drilling will be done.

La Vaca County

SHAWNEE OIL (Hallettsville)—Large acreage secured by lessees, and test wells will be sunk for oil.

Liberty County

SUN CO. (Hull)—No. 1 Carr well being tested; indications good for production. Well abandoned several months ago in salt at 900 ft. Drilling resumed later, and salt passed through.

Tom Green County

OIL DRILLING NEAR SAN ANGELO under way. San Diego & Texas Oil Co., drilling on T. J. Clegg ranch, 15 miles north of town, passed through 10 ft. oil sand at 800 ft. Tucker Oil Co., of Dallas, down 1400 ft. on Harris Bros. ranch, 25 miles north of San Angelo, just over Coke County line. Central Oil Co. has moved rig from Maryneal, Nolan County, to John Saul ranch, in Coke County, where test well will be drilled 4,000 ft. if necessary.

Wichita County

TEXAS OIL, GAS & MINERAL PRODUCTS (Burkburnett)—Gusher brought in July 22 that shot over derrick. Company controlled by W. C. Munn and associates, of Houston. Drilling also being done in Grimes County.

RED RIVER PIPE LINE (Wichita Falls)—Incorporated recently under Delaware laws for $1,000,000. Right-of-way secured for pipe line from northwest extension of Burkburnett field to Wichita Falls. Pipe purchased, and construction will begin at once. Capacity, 20,000 bbl. daily.

UTAH

Beaver County

GOLDEN REEF (Frisco)—Work being done in hope of finding extension of Horn Silver vein in adjoining Horn Silver property.

Juab County

EUREKA BULLION (Eureka) — Ore showing good and working force to be increased at this East Tintic property.

NORTH STANDARD (Eureka) — New 35-hp. motor at property. Work shows increasing mineralization.

PROVO MINING (Eureka)—Rumored control of small territory in East Tintic gained by Tintic Standard adjoining.

TINTIC DRAIN TUNNEL (Eureka) — Shaft to be sunk on line of tunnel, at point about midway between Iron Blossom and portal of tunnel, to be of use in tunnel work as well as to open promising mineral ground.

PINION QUEEN (Eureka)—Understood Knight interests have gained control of this East Tintic property, situated near North Standard.

Morgan County

UTAH SILVER-LEAD (Peterson)—Old Carbonate Hill, credited with production of $400,000 to $700,000 in early days, taken under bond and lease by Utah Silver-Lead company. J. Howard Garrett, G. W. Morgan, and W. H. Bywater interested. Old workings total 6,000 to 7,000 ft. Considerable ore opened on Silver Zone claim by new work, 700 to 800 ft. from old workings. Tunnel being driven to get under orebody in 1,000 ft., with about 240 ft. more to go. Property comprises seven patented and four unpatented claims. Lease runs for period of years, royalties to go toward payment for property. Bonded indebtedness, $125,000; first payment of $10,000 due in about two years. Company has 400,000 shares in treasury.

Salt Lake County

UTAH CONSOLIDATED (Bingham Canyon)—Reported mill of Utah Metal & Tunnel Co. leased for three months' experimental work and that mill to treat low-grade lead ores will soon be built.

Summit County

PARK CITY SHIPMENTS week ended July 26 amounted to 2,835,110 lb. Shippers: Ontario Silver, Daly West, Naildriver, Judge Mining & Smelting, and Silver King Coalition.

GLEN-ALLEN (Park City)—Contract let for small mill. Development work being pushed. M. P. Braffet, Major S. A. King, and R. G. Schulder interested.

ONTARIO SILVER (Park City) —Lessees forced to cease work at time of strike again operating.

Tooele County

WESTERN UTAH COPPER (Gold Hill) —Work on concentrator being pushed. To be operated on custom basis. Development on lower levels encouraging. Working force doubled. Shipments of copper and lead ores resumed, owing to better market.

WASHINGTON

Pend Oreille County

BEAD LAKE GOLD (Newport)—Has moved to its property the mill machinery purchased from Western Union Mining Co. in Coeur d Alenes. Expect to erect small concentrator. W. E. Allen, of Spokane, manager.

Snohomish County

SUNSET COPPER (Index)—Operations resumed in mine and mill.

Lincoln County

O-LO-LIM COPPER (Davenport)—Company operating on Spokane Indian Reservation about three miles from Detillion Bridge shipped ten 30-ton cars averaging 9 per cent copper to Tacoma smeltery in last six months. Ore hauled 26 miles to railroad at Davenport. James Keith, of Spokane, president.

Stevens County

ELECTRIC POINT (Northport)—Hauling ore by auto trucks to railroad at Boundary while awaiting better market and smelting conditions. Handicapped by inability to ship to Trail. Exploration work in progress. Roy Young manager.

COLVILLE VALLEY COAL (Valley) — Will ship first coal in August to Loon Lake Copper Co., latter hauling it twelve miles by truck. Said to be first coal marketed in Washington from mines east of Columbia River.

CANADA

British Columbia

MOLLY GIBSON (Paulson)—Ore struck 240 ft. from portal of tunnel on 300-ft. level.

CANADA COPPER (Princeton) — Settlement of strike said to be near at hand, miners to get 50c. advance for nine-hour day. Construction of railroad and power line will be resumed as soon as strike is settled, but delay of nearly four months caused by strike may prevent operation of property before next spring.

GIBSON (Slocan) — President D. K. May, of Spokane, re-elected at annual meeting held at Kalso, B. C.; E. H. Latham, of Spokane, secretary-treasurer. Other directors are Robert Gunning, Spokane; Joseph Daschbach, Opportunity, Wash.; and F. E. Archer, Kaslo.

GOLD CURE (Slocan)—Crew of men put to work. Charles F. Caldwell, of Kaslo, president.

Ontario

KILPATRICK CLAIM (Gowganda) — Property situated near Miller Lake-O'Brien taken over by W. Young and associates, and will be actively developed.

REEVE-DOBIE (Gowganda) — Installation of flotation plant completed.

WEST END (Port Arthur district) — Being worked by Mining Corporation of Canada, which recently made shipment of ore.

NORTH DAVIDSON (Porcupine) — Power transmission will be laid from Davidson to property.

NORWOOD (South Porcupine)—Has let contract for 6,000 ft. of diamond drilling.

MEXICO

San Luis Potosi

MANGANESE ORE being shipped through Charcas station from Santo Domingo district 30 miles west of Charcas. Petronilo Lopez in charge.

SAN DIEGO (Charcas)—J. T. Murphy shipping about 1,200 tons of ore from dump each month. Property about five miles west of Charcas.

TIRO GENERAL (Charcas) — Being unwatered by air lift. Depth of 650 ft. has been reached in one stage. High silver price causing considerable ore to be shipped from dump. S. F. Shaw, superintendent.

DOLORES (Matehuala) — Operating at about two-thirds capacity. E. E. Reyer superintendent

SANTA MARIA DE LA PAZ (Matehuala) — Operating steadily owing to high price of silver. G. M. Wastehys general manager.

Zacatecas

BONANZA (Bonanza)—Long prospect tunnel being driven. S. F. Shaw, superintendent.

MATTHEWS AND IANKES operating property in San Pedro de Ocampo district.

MAZAPIL COPPER operating two copper furnaces at Concepcion del Oro. Lead smeltery at Saltillo in steady operation. San Eligio mine producing lead ore and Aranzazu group copper ore. Both properties near Concepcion del Oro. R. H. Jeffreys general manager.

PURCELL INTERESTS operating Catacillas and other properties in Mazapil district. P. K. Lucke consulting engineer.

AUSTRALIA

New South Wales

AT BROKEN HILL, mine buildings valued at $500,000 have been destroyed by fire, according to London press dispatch dated July 31. Incendiarism given as cause.

BELGIAN CONGO

UNION MINIERE DU HAUT KATANGA (Elisabethville)—Copper production in June was 4,519,430 lb.

THE MARKET REPORT

Daily and Weekly Metal and Mineral Prices, Metal Market Conditions, Average Monthly Prices, Stock Quotations

Silver and Sterling Exchange

July Aug.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Aug.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
31	435½	107⅝	55 9/16	4	435	109⅜	....
1	435¼	108	55¾	5	435¼	108¾	56⅛
2	435	109⅜	56½	6	431½	109⅜	57

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of ba silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

Daily Prices of Metals in New York

July-Aug.	Copper Electrolytic	Tin Spot	Lead N. Y.	Lead St. L.	Zinc St. L.
31	22.85@23.10	68	5.75@5.85	5.60@5.65	7.40 @7.50
1	22¾	67	5.75@5.85	5.60@5.65	7.20 @7.30
2	22⅝	66	5.75@6.00	5.65@5.70	7 @7¼
4	22½	66	5.75@6.00	5.65@5.70	7¼@7⅜
5	22½	65½	5.75@6.00	5.65@5.70	7⅜@7½
6	22.35@22.45	65½	5.75@6.00	5.65@5.70	7½

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other special shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of American tin, 99 per cent grade.

London

July-Aug.	Copper Standard Spot	Copper Standard 3 M.	Copper Electrolytic	Tin Spot	Tin 3M.	Lead Spot	Lead 3 M.	Zinc Spot	Zinc 3 M
31	102	102½	...	272	267½	24	24¾	41	41¼
1	101½	102	...	275	269	24½	25	41¼	41¾
2	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...
5	99½	100½	...	276	268	25¼	25¾	40½	41½
6	96	97	108	276	263½	24¾	25½	39¾	40¾

The above table gives the closing quotations on the London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb.

Metal Markets

New York, Aug. 6, 1919

All of the metal markets this week were extremely dull and were rather disturbed, neither of which conditions was surprising in view of the phenomenally large sales that were made in July and the collapse in the stock market on Monday.

Freight rates to British and French ports are $18. From San Francisco to Hongkong and Kobe, $12.

In a recent hearing before a subcommittee of the House of Representatives, the following was testified respecting the ordnance stocks of metals and the disposition thereof: Antimony, total stock, 3,330,914 lb., whereof 2,918,000 lb. has been sold, principally to the Wah Chang Trading Co., at about 6⅝c. per lb. Copper ingot, 100,000,000 lb., all sold. Lead, about 15,000 tons, whereof about 12,000 tons has been sold. Zinc, 42,500 tons, whereof 1,000 tons has been sold at 7c. per lb. Platinum, 19,000 oz., whereof 8,650 oz. has been sold at $105 per oz. The Government's large stocks of brass manufactures remain unsold, as also is about 20,000,000 lb. of copper in semi-manufactured forms. Also, the Government has 170,000,000 lb. of other brass, whereof none has been sold, but in connection with which a contract is now pending.

It is plainly the intention of the subcommittee headed by Representative Graham, which is investigating ordnance expenditures during the war, to show that the Government agencies were improperly influenced by the copper producers in making arrangements for the disposition of the Government's surplus stock of copper after the war. E. C. Morse, assistant director of sales, submitted the following figures:

	Pounds
April sales by producers	89,864,239
Government's share of same	12,972,920
May sales by producers	207,649,198
Government's share of same	36,529,838
June sales by producers	202,539,751
Government's share of same	35,507,950

The remainder of the Government's copper was sold in July. All of the Government copper was sold on a rising market. The Government realized the same price that the producers did for their own copper, sold contemporaneously, less the usual selling commission of 1 per cent.

Copper

No business was done this week by any of the big producers. The market was established by the reselling of copper by speculators and by consumers who found themselves overbought. A good deal of such business was offered at prices that were shaded from day to day. In such a market variations in terms are naturally to be expected, and we can do nothing more than generalize. However, a round lot was sold Wednesday morning by a small producer on terms equivalent to 22.45c., cash, New York, and during Wednesday afternoon August-September contracts were offered at the equivalent of 22.35c., New York. But for the moment there is no further buying demand worth mentioning. On the other hand, the principal producers are firm in asking their previous price of 23 1-2c., delivered.

Germany bought 1,000 tons of copper through the Export Association last week.

Sales of copper by American producers in July were larger than those of any other month this year, which is saying a good deal.

Copper Sheets—The base price of copper sheets at 33½c. per lb. Demand strong. Copper wire is quoted at 26@27c. in carload lots, f.o.b. mill. Market not very strong, but producers are holding firm. Considerable second-hand copper is being offered.

Tin

With the arrival of the first lots of shipment tin permitted to enter this country, and the consequent increase in the supply, the market for tin of 99 per cent grade began on Aug. 1 to decline sharply, and up to today has fallen about 2½c. per lb. The market for Straits and electrolytic tin, however, has remained steady at 70c. From now on there will be steady arrivals, and with the increase in supplies in this market further declines may be expected.

Straits tin, July shipment, was quoted at 54c. on July 31; at 54¼c. on Aug. 1, 2 and 4; at 54½c. on Aug. 5; and at 54¼c. on Aug. 6. August shipment was about ¼c. less.

Singapore quoted, c.i.f., London, as follows: July 31, £269¼; Aug. 1, £269¼; Aug. 5, £271; and Aug. 6, £271½.

Lead

The lead market, like that for copper, was dull. Lead held speculatively was offered freely at 5.75c., and consumers bought at that price. On the other hand, the principal producers found themselves able to get the price that they asked, viz. 6c., from some of their regular customers. The market can, therefore, be characterized only as irregular. It is certain that no large tonnage could be bought at 5.75c., or could be sold at 6c., but without doubt liberal supplies could be obtained around 5¾c.

The statistical position of lead is excellent, and without doubt is better than that of any of the other metals. There was a sharp reduction in stocks during July.

Germany has been buying lead in Great Britain.

Zinc

Under the influence of efforts to realize, the sharp decline in the market continued, and during the morning of Aug. 2, 7c. was touched. From 7¼c. down to 7c., however, there was found to be strong resistance to the decline Speculative interests attempting to cover their short contracts, and others endeavoring to institute new bull accounts, found that they could not easily buy what they desired. Therefore, a sharp rally naturally ensued, and the week closed with the market at 7½c.

The Great Falls zinc works of the Anaconda company are closed.

Germany is selling zinc in England, which has had the effect of depressing the price there to a point that is far below our parity and has therefore killed any immediate prospect for export sales to Europe.

Zinc Sheets—The quoted price of zinc sheets is $10 per 100 pounds.

Other Metals

Aluminum—Virgin metal quoted at 32½@33c. per lb. Market dull. Very little business.

Antimony — Unchanged at 9¼@9½c. for spot, with market quiet but firm. Owing to interruption of cables there were no quotations for futures.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $3.10 per lb. for wholesale lots—500 lb. and over. No change.

Cadmium—Quoted at $1.50 per lb. in lots of 500 pounds. For lots under 200 pounds, $1.75 per lb. No change. A little increase in business.

Nickel—Ingot, 41c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—Unchanged at $109, at which price the market is strong. San Francisco telegraphs $103, steady.

Silver and Platinum

Silver—The market has ruled firm, with an advancing tendency in London, closing at 57d. With comparative steadiness in sterling exchange, New York price has been strong on buying for China, and offerings have been absorbed for export to the Far East at prices over the London market equivalent. Market closes firm, notwithstanding weakness in sterling exchange.

Mexican dollars at New York: July 31, 83¼; Aug. 1, 83½; Aug. 2, 84⅝; Aug. 4, 84⅝; Aug. 5, 84⅛; Aug. 6, 84⅝.

Platinum—We quote refined ingot at $105.

Palladium—Unchanged at $120.

Zinc and Lead Ore Markets

Joplin, Mo., Aug. 2—Zinc blende, per ton, high, $56.85; basis 60 per cent zinc, premium, $48; Prime Western, $47.50; fines and slimes, $45@$42.50; calamine, basis 40 per cent zinc, $30. Average settling prices: Blende, $52.12; calamine, $31.50; all zinc ores, $51.73.

Lead, high, $67.95; basis 80 per cent lead, $67.50; average settling price, all grades of lead, $63.72 per ton.

Shipments the week: Blende, 7,805; calamine, 148; lead, 1,079 tons. Value, all ores the week, $481,770.

Buyers had light orders for this week, and all stood firm on offerings of $47.50 basis, a drop of $7.50 from last week. Some sellers declined to accept the low price level, but others sold. Settling prices are based on last week's purchases, settlements of which were made this week.

Platteville, Wis., Aug. 2 — Blende, basis 60 per cent zinc, $50 per ton base for premium grade. One car of Prime Western grade sold Friday at $50 base, but buyers declined to buy Saturday at $47.50 base. Lead ore, basis 80 per cent lead, $67 per ton. Shipments for the week are 1,637 tons blende, 182 tons galena, and 552 tons sulphur ore. For the year to date the totals are 58,928 tons blende, 3,478 tons galena, and 9,069 tons sulphur ore. During the week 3,200 tons blende was shipped to separating plants.

Other Ores

Chrome Ore—Unchanged at $25 per ton, f.o.b., California points, for ore running 40 per cent or better.

Manganese Ore—Unchanged at 60c. per unit asked, and 50c. bid.

Molybdenum Ore—No business reported. The last quotation was 85c.

Tungsten Ore — Some business in Chinese ore was reported at $7.27@$7.75. High-grade ore was sold at $9.25. Altogether, however, the market was small.

Other Minerals

Nitrate—Dealers are quoting a price of $3 per cwt., but little business is being transacted, in view of anticipated changes in price of nitrate from Chile. Nitrate production in Chile during May, 1919, according to *Commerce Reports*, amounted to 3,039,390 Spanish quintals or 154,157 tons of 2000 lb., compared with 268,574 tons in May, 1918. Exports at present are negligible.

Pyrites—Spanish pyrites is quoted at 17½c. per unit for furnace-size lump ore, free from fines, c.i.f., New York or other Atlantic port. Run-of-mine ore is quoted at 16½c. Market slow and unsettled; hand-to-mouth buying. Price will decrease with ocean freights.

Iron Trade Review

Pittsburgh, Aug. 5.—Unfavorable influence in general trade, the continued high rate on dollar exchange, labor unrest, agitation over the high cost of living, the threat of railroad men to strike if their proposal for tripartite operation of the railroads is not accepted, and the strikes of railway shopmen in various sections have not visibly decreased the total volume of steel orders placed or arrested the tendency to increase production. At some points, particularly at Gary, there is forced curtailment of pig-iron and steel production by the absence of transportation facilities, caused by railroad shopmen's strikes.

Steel producers recognize, however, that factors unfavorable to the future have developed, and progress of the iron and steel industry to a stage of full operation may be slower than was expected a month or two months ago. The exchange situation has clearly operated to curtail the buying of American products by Great Britain and Europe, but there remains good buying by Japan, China, and South America.

Though no definite expectation had been entertained as to when a resumption of railroad buying of steel and other products could be expected, it is recognized that the additional uncertainties injected into the general situation as to what is going to be done with the railroads tend to postpone the inception of railroad buying, and this is a matter of great importance, as the hope recently entertained in some quarters that the steel industry could reach the full protective activity without the support of railroad buying has been abandoned.

Without allowing for the temporary curtailment in tonnage caused by railroad strikes, the steel industry is operating at fully 75 per cent of capacity. Pipe, wire, sheet, and tin-plate mills are operating almost full, and plate, structural, and rail mills are operating at relatively low rates. Structural-mill operations are increasing. Merchant bar production is at not far from capacity, and the distribution of orders for bars, as to classes of consumers involved, is improved.

Effective Aug. 1, rivet makers have advanced prices $4 a ton, to 3.90c for button-head structural rivets and 4c for cone-head boiler rivets.

Pig Iron.—Trading is of moderate proportions, in point of tonnage. Foundry iron is well sold up, as to the operating furnaces, but idle furnaces would have some difficulty in selling enough backlog tonnage to justify blowing in unless they should cut prices.

Bessemer and basic remain quiet, and a really strong market in pig iron cannot be expected unless some of the large steel works buy considerable tonnages to supplement their own make. The market remains quotable as follows: Bessemer, $27.95; basic, $25.75; foundry, $26.75; forge, $25.75, f.o.b. Valley furnaces, with $1.40 freight to Pittsburgh. W. P. Snyder & Co. announce average prices in July for Valley iron, computed from actual sales, at $27.95 for bessemer and $25.75 for basic. The average quotation for foundry iron in July was $26.75. All these averages are at the recognized market.

Steel

Steel.—An open market demand of considerable proportions has developed for sheet bars. Several sheet mills, usually well provided by their own production or by contracts, have purchased in the open market, in the past week, one taking 2,500 tons of bessemer bars and another 3,000 tons of open-hearth. Not only are sales made at full prices, but in one instance a Youngstown mill secured the full $42 price at mill, when in ordinary circumstances it would have had to take 30c. less by equalizing with Pittsburgh. No sheet bars can be secured from Pittsburgh mills, and the Steel Corporation is even shipping bars from Gary to the general Pittsburgh district, this being an unusual though not unprecedented movement. Billets remain quiet. There is a moderate demand for forging billets, and it is stated that the full March 21 price is being obtained. We quote: Billets, $38.50; forging billets, $51; sheet bars and small billets, $42; slabs, $41; f.o.b. Pittsburgh or Youngstown; rods, $52, Pittsburgh.

Ferroalloys

Ferromanganese.—Inquiry for ferromanganese continues light. Consumers still have material due them, and buy only when they must, then requiring such early delivery that it is uncertain that much English ferromanganese would be purchased despite the more favorable price. It is possible that domestic producers would cut their asking price if there were any danger of losing business to British producers. Quoted prices for 80 per cent are $115, delivered, for domestic, and $105, c.i.f., for English.

Coke

Coke.—Several hundred carloads of furnace coke are on track in the Connelsville region awaiting disposition. Producers quote $4, at which there is no demand, furnaces being well supplied on contract and apparently desiring decided bargains on coke they might buy for stock. Foundry coke is stiff, demand being fully equal to offerings, which are a trifle restricted because of the extra labor involved in shipping foundry coke as compared with furnace. No more foundry coke can be had at $4.75, prices for spot and prompt being $5 to $5.50, according to brand, per net ton at ovens.

MONTHLY AVERAGE PRICES OF METALS

Silver

	New York			London		
	1917	1918	1919	1917	1918	1919
Jan.	75.630	88.702	101.125	36.682	44.356	48.438
Feb.	77.585	85.716	101.125	37.742	42.792	48.027
Mar.	73.861	88.082	101.125	36.410	43.620	48.171
April	73.875	95.346	101.125	36.963	47.215	48.886
May	74.745	99.505	107.135	37.940	48.980	52.104
June	76.971	99.500	110.430	39.065	48.875	53.896
July	79.010	99.625	106.394	40.110	48.813	54.133
Aug.	85.407	100.292	.....	43.418	49.077	.....
Sept.	100.740	101.125	.....	50.920	49.500	.....
Oct.	87.332	101.125	.....	44.324	49.500	.....
Nov.	85.891	101.125	.....	43.584	48.969	.....
Dec.	85.960	101.125	.....	43.052	48.492	.....
Year.	81.417	96.772	.....	40.851	47.516	.....

New York quotations cents per ounce troy, 999 fine London, pence per ounce, sterling silver, 925 fine.

Copper

	New York		London			
	Electrolytic		Standard		Electrolytic	
	1918	1919	1918	1919	1918	1919
Jan.	23.500	(a)	110.000	92.238	125.000	106.619
Feb.	23.500	16.763	110.000	78.700	125.000	95.700
Mar.	23.500	14.856	110.000	76.821	125.000	82.071
April	23.500	15.246	110.000	77.300	125.000	82.200
May	23.500	15.864	110.000	77.767	125.000	81.227
June	23.500	17.610	110.000	83.062	125.000	85.900
July	25.904	21.604	119.913	99.576	134.913	103.046
Aug.	26.000	.....	122.000	.....	137.000	.....
Sept.	26.000	.....	122.000	.....	137.000	.....
Oct.	26.000	.....	122.000	.....	137.000	.....
Nov.	26.000	.....	122.000	.....	137.000	.....
Dec.	(a)	.....	118.447	.....	133.167	.....
Year.	24.628	.....	115.530	.....	130.507	.....

(a) No market.

Tin

	New York		London	
	1918	1919	1918	1919
January	85.500	67.702	293.227	248.557
February	92.000	66.801	311.525	223.963
March	(a)	67.934	318.875	286.843
April	(a)	72.500	329.905	225.275
May	(a)	72.500	364.217	234.398
June	(a)	71.240	331.925	238.263
July	(a)	68.000	360.347	253.272
August	(a)	.....	380.900	.....
September	(a)	.....	343.905	.....
October	(a)	.....	335.543	.....
November	(a)	.....	323.550	.....
December	(a)	.....	267.736	.....
Av. year	(a)	.....	330.138	.....

(a) No average computed.

Lead

	New York		St. Louis		London	
	1918	1919	1918	1919	1918	1919
January	6.782	5.432	6.684	5.316	29.00	37.227
February	6.973	5.057	6.899	4.784	29.00	28.675
March	7.201	5.226	7.091	4.992	29.00	27.952
April	7.772	4.982	6.701	4.722	29.00	24.888
May	6.818	5.018	6.704	4.773	29.00	23.852
June	7.611	5.340	7.511	5.070	29.00	22.544
July	8.033	5.626	7.750	5.408	29.00	23.457
August	8.050	.....	7.750	.....	29.00	.....
September	8.050	.....	7.750	.....	29.00	.....
October	8.050	.....	7.750	.....	29.00	.....
November	8.050	.....	7.750	.....	31.20	.....
December	6.564	.....	6.324	.....	40.00	.....
Year	7.413	.....	7.222	.....	30.10	.....

Zinc

	New York		St. Louis		London	
	1918	1919	1918	1919	1918	1919
January	7.836	7.272	7.661	7.922	54.000	56.045
February	7.814	6.623	7.639	6.273	54.000	46.150
March	7.461	6.500	7.286	6.150	54.000	38.500
April	6.890	6.465	6.715	6.114	54.000	36.118
May	7.314	6.429	7.114	6.079	54.000	35.477
June	8.021	6.901	7.791	6.551	54.000	36.763
July	8.688	7.873	8.338	7.523	54.000	41.815
August	8.985	.....	8.635	.....	54.000	.....
September	9.442	.....	9.092	.....	54.000	.....
October	8.801	.....	8.451	.....	54.000	.....
November	8.481	.....	8.141	.....	54.100	.....
December	8.163	.....	7.813	.....	56.050	.....
Year	8.159	.....	7.890	.....	54.180	.....

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pittsburgh

	Bessemer‡		Basic‡		No. 2 Foundry	
	1918	1919	1918	1919	1918	1919
January	$37.25	$33.60	$33.95	$31.40	$33.95	$32.40
February	37.25	33.60	33.95	31.40	33.95	32.40
March	37.25	32.54	33.95	31.40	33.95	29.12
April	36.15	29.35	32.95	27.15	33.95	28.15
May	36.20	29.35	33.00	27.15	34.00	28.15
June	36.36	29.35	33.16	27.15	34.16	28.15
July	36.60	29.35	33.40	27.15	34.40	28.15
August	36.60	.....	33.40	.....	34.40	.....
September	36.60	.....	33.40	.....	34.40	.....
October	36.60	.....	34.40	.....	35.40	.....
November	36.60	.....	34.40	.....	35.40	.....
December	36.60	.....	34.40	.....	35.40	.....
Year	$36.67	.....	$33.70	.....	$34.45	.....

‡ As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N. Y. Exch.†	Aug. 5
Alaska Gold M.	2⅞
Alaska Juneau	2⅛
Am.Sm.&Ref.,com.	78
Am.Sm. & Ref.,pf.	106
Am.Sm.Sec., pf., A.	90
Am. Zinc	23
Am. Zinc, pf.	58½
Anaconda	69½
Batopilas Min.	1½
Bethlehem Steel	80
Butte & Superior	24½
Butte Cop. & Zinc	13
Cerro de Pasco	55½
Chile Cop.	23⅝
Chino	45
Colo. Fuel & Iron	44½
Crucible Steel	130¼
Crucible Steel, pf.	101
Dome Mines	13½
Federal M. & S.	15
Federal M. & S., pf.	39¾
Great Nor., ore ctf.	44½
Greene Cananea	42
Gulf States Steel	57
Homestake	70
Inspiration Con.	60½
International Nickel	28
Kennecott	36½
Lackawanna Steel	80
Mexican Petrol.	178½
Miami Copper	27½
Nat'l Lead, com.	81
National Lead, pf.	110½
Nev. Consol.	18⅛
Ontario Min.	7
Ray Con.	24½
Republic I.&S.,com.	87½
Republic I.&S., pf.	104½
St. Joseph Lead	15½
Sloss-Sheffield	61
Tennessee C. & C.	13⅞
U. S. Steel, com.	104⅛
U. S. Steel, pf.	114⅛
Utah Copper	87
Va. Iron C. & C.	‡64
Worthington Pump.	72½

Boston Curb *	Aug. 5
Boston Ely	1⅛
Boston & Mont.	.83
Butte & Lon'n Dev.	.18
Calaveras	1½
Chief Con.	3½
Contact	‡.05
Cortez	.12
Crown Reserve	.25
Crystal Cop.	11
Crystal Cop. (new)	.53
Eagle & Blue Bell	2⅛
First Nat. Cop.	2½
Gadsen Cop.	4
Houghton Copper	1
Intermountain	‡.05
Iron Blossom	.25
Iron Cap	12½
Majestic	.30
Mexican Metals	.08
Mojave Tungsten	.13
Nat. Zinc & Lead	.08
Nevada-Douglas	.26
New Baltic	3½
Oneco	1½
Rex Cons.	.20
United Verde Ex.	.43
Yukon Gold	1

San Fran.*	Aug. 5
Alta	‡.08
Andes	.20
Best & Belcher	.17
Caledonia	.20
Challenge Con.	‡.03
Confidence	‡.25
Con. Virginia	2.15
Gould & Curry	.07
Hale & Norcross	‡.20
Jacket-Cr. Pt.	.13
Mexican	.31
Occidental	‡.40
Ophir	1.55
Overman	.10
Savage	‡.22
Sierra Nevada	.15
Union Con.	.13
Utah Con.	.03
Belmont	3.50
Jim Butler	‡31
MacNamara	.76
Midway	.24
Mont.-Tonopah	.15
North Star	.07
Rescue Eula	.20
West End. Con.	1.65
Atlanta	.04
Booth	.07
Comb. Frac.	.05
Florence	.59
Jumbo Extension	.11
Kewanas	.04
Nevada Hills	.02
Nevada Packard	.20
Round Mountain	.37
Silver Pick	.06
White Caps	.18

Colo. Springs *	Aug. 5
Cresson Con.	3.00
Doctor Jack Pot	.04
Elkton Con.	.03½
El Paso	.14
Gold Sovereign	‡.02
Golden Cycle	1.65
Granite	.10
Isabella	.03½
Mary McKinney	.07
Portland	.89
United Gold M.	.17½
Vindicator	.40

Boston Exch.†	Aug. 5
Adventure	‡2⅜
Ahmeek	84
Algomah	1
Alloues	45½
Ariz. Com.	15½
Arnold	‡.20
Bingham Mines	8¾
Bonanza	‡.20
Butte-Balaklava	.65
Calumet & Ariz.	76½
Calumet & Hecla	450
Carson Hill	‡17½
Centennial	18
Copper Range	56
Daly West	3
Davis-Daly	9½
East Butte	17½
Franklin	5⅜
Granby	‡73½
Hancock	8¾
Hedley	‡12
Helvetia	5
Indiana	1⅜
Isle Royale	36½
Keweenaw	1⅞
Lake	6⅜
La Salle	4¾
Mason Valley	3½
Mass	8
Mayflower	9⅞
Michigan	8
Mohawk	74
New Arcadian	4½
New Cornelia	26½
New Idria	11⅜
Nipissing	10½
North Butte	15⅜
North Lake	1⅛
Ojibway	⅞
Old Dominion	45
Osceola	63
Quincy	76
St. Mary's M. L.	67
Santa Fe	‡.35
Seneca	22½
Shannon	3¾
Shattuck-Ariz.	‡15⅝
So. Lake	3⅛
So. Utah	25
Superior	‡9⅛
Superior & Bost.	3
Trinity	3½
Tuolumne	1⅛
U. S. Smelting	66
U. S. Smelting, pf.	49
Utah Apex	3
Utah Con.	11⅛
Utah Metal	4½
Victoria	6
Winona	2½
Wolverine	26

N. Y. Curb.†	Aug.
Alaska B. C. Met.	1
Alaska Mines	⅛
Big Ledge	⅛
Butte & N. Y.	⅛
Butte Detroit	‡.03
Caledonia	.38
Calumet & Jerome	⅛
Can. Cop. Corpn.	1⅛
Cashboy	.06½
Con. Ariz. Sm.	1⅛
Con. Coppermines	6½
El Salvador	3½
Goldfield Con.	.18
Goldfield Merger	.05
Hasbrouck Divide	.13
Hecla Min.	5⅜
Howe Sound	4¼
Louisiana	1½
Magma	‡40
Marsh	.09
McKinley-Dar-Sa.	‡.60
Milford	‡.75
Mother Lode	.49
Nixon Nevada	.25
Ohio Cop.	⅛
Rawley	‡2½
Ray Hercules	2⅜
Richmond	‡.50
Rochester Mines	.18
Silver King of Ariz.	1
So. Am. G. & P.	9½
Standard S. L.	⅛
Stewart	.24
Success	.06
Tonopah	3
Tonopah Divide	6½
Tonopah Ex.	2⅛
Tribullion	‡.25
Troy Arizona	‡.10
United Eastern	4⅛
Utica Mines	‡.08

Toronto *	Aug. 4
Adanac	.08
Bailey	.03
Beaver Con.	.30
Coniagas	2.00
Hargraves	.02
Kerr Lake	‡4.75
La Rose	.25
Lake Shore	.75
Min. Corp. of Can.	1.50
Peterson Lake	.08
Teck-Hughes	.15
Temiskaming	.33
Trethewey	.28
Wettlaufer-Lor.	.03
Davidson	‡.68
Dome Exten.	.28
Dome Lake	.15
Hollinger	6.00
McIntyre	1.62½
Newray	.06½
Percu. Crown	.24
Vipond	.18
West Dome	.10

* Bid prices. † Closing prices. ‡ Last quotations.

Current Prices—Materials and Supplies

IRON AND STEEL

SHEETS—Quotations are in cents per pound in various cities from warehouse also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	St. Louis	Chicago	San Francisco	New York Current	New York One Yr. Ago
No. 10	3.55	4.64	4.57	5.80	4.57	5.50
No. 12	3.60	4.69	4.62	5.75	4.62	5.55
No. 14	3.65	4.74	4.67	5.90	4.67	5.60
Black						
Nos. 18 and 20	4.15	5.24	5.17	6.75	5.30	6.30
Nos. 22 and 24	4.20	5.29	5.22	6.80	5.35	6.35
No. 26	4.25	5.34	5.27	6.95	5.40	6.40
No. 28	4.35	5.44	5.37	7.05	5.50	6.50
Galvanized:						
No. 10	4.70	5.79	5.97	....	6.20	6.85
No. 12	4.80	5.89	6.07	7.30	6.25	6.95
No. 14	4.80	5.89	6.07	7.30	6.30	6.95
Nos. 18 and 20	5.10	6.19	6.37	7.60	6.60	7.25
Nos. 22 and 24	5.25	6.34	6.52	7.75	6.75	7.30
No. 26	5.40	6.49	6.67	7.90	6.90	7.45
No. 28	5.70	6.79	6.97	8.20	7.20	7.75

STEEL RAILS—The following quotations are per gross ton f.o.b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh Current	Pittsburgh One Year Ago	Chicago Current	Chicago One Year Ago
Standard bessemer rails	$45.00	$65.00	$45.00	$65.00
Standard openhearth rails	47.00	67.00	47.00	67.00
Light rails, 8 to 10 lb.	2.58½*	3.36*	2.83½*	3.36½*
Light rails, 12 to 14 lb.	2.54*	3.09*	2.79*	3.09*
Light rails, 25 to 45 lb.	2.45*	3.00*	2.70*	3.00*

* Per 100 lb.

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh Current	Pittsburgh One Year Ago	Chicago	St. Louis	San Francisco
Standard rai road spikes, ⅞-in. and larger	$3.35	$3.90	$4.27	$4.44	$5.65
Track bolts	4.35	4.90	5.17	Premium	6.65
Standard section angle bars	3.00	3.25	4.22	Premium	4.60

STRUCTURAL MATERIAL—The following are the base prices f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Mill Pittsburgh	New York Current	New York 1 Yr. Ago	St. Louis	Chicago
Beams, 3 to 15 in.	$2.45	$3.47	$4.245	$3.54	$3.47
Channels, 3 to 15 in.	2.45	3.47	4.245	3.54	3.47
Angles, 3 to 6 in., ¼ in. thick	2.45	3.47	4.245	3.54	3.47
Tees, 3 in. and larger	2.45	3.52	4.245	3.54	3.47
Plates	2.66	3.67	4.495	3.54	3.67

STEEL SHEET PILING—The following price is base per 100 lb. f.o.b. Pittsburgh, with a comparison of a month and a year ago:

Current	One Month Ago	One Year Ago
$2.55	$2.55	$4–5

RIVETS—The following quotations are per 100 lb.:

	Mill Pittsburgh	New York Current	New York One Year Ago	Chicago	St. Louis	San Francisco	Dallas
STRUCTURAL (Warehouse)							
½-in. and larger	$4.20	$4.72	$5.65	$4.72	$4.79	$6.05	$5.90
CONE HEAD BOILER							
½ in. and larger	4.30	4.82	5.75	4.82	4.89	6.15	6.00
⅝ and ¾	4.45	4.97	5.90	4.97	5.04	6.30	6.15
⅞ and 1	4.70	5.22	6.25	5.32	5.29	6.65	6.50

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Galvanized iron rigging	+12½%
Galvanized cast steel rigging	7½%
Bright plow steel	35%
Bright cast steel	22½%
Bright iron and iron tiller	5%

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Mill Pittsburgh	Cincinnati	Chicago	St. Louis	Denver	Birmingham
Straight	$5.75	$7.50	$6.50	$6.25	$8.50	$7.35
Assorted	.....	7.50	6.50	6.40	8.75	7.60

BAR IRON AND STEEL—Per pound to large buyers at mill, Pittsburgh:

Iron bars.....2.75c. Steel bars.....2.35c.

COAL BIT STEEL—Warehouse price per pound is as follows:

New York	Cincinnati	Birmingham	St. Louis	Denver	Chicago
$0.12	$0.16½	$0.18	$0.19	$0.18½	$0.16½

DRILL STEEL—Warehouse price per pound:

	New York	St. Louis	Birmingham	Denver
Solid	14c.	13c.	15c.	15c.
Hollow	18c.	14c.	...	20c.

STEEL AND IRON PIPE—The following discounts are for carload lots f.o.b. Pittsburgh, basing card of National Tube Co. for steel pipe, Cardry A. M. Byer's for iron, both dated Mar. 21, 1919.

Inches	Steel Black Per Cent.	Galvanized Per Cent.	Inches	Iron Black Per Cent.	Galvanized Per Cent.
BUTT WELD					
⅛ to 3	57½	44	¼ to 1½	39½	23½
LAP WELD					
2	50½	38	1¼	24½	9½
2½ to 6	53½	41	1½	31½	17½
7 to 12	50½	37	2	32½	18½
13 and 14	41	..	2½ to 6	34½	21½
15	38½	..	7 to 12	31½	18½
BUTT WELD, EXTRA STRONG PLAIN ENDS					
⅛, ¼ and ⅜	46½	29	⅛, ¼ and ⅜	28½	11½
½	51½	39	½	33½	20½
¾ to 1¼	55½	43	¾ to 1½	39½	24½
2 to 3	56½	44			
LAP WELD, EXTRA STRONG PLAIN ENDS					
2	48½	37	1½	25½	10½
2½ to 4	51½	40	1½	31½	17½
4½ to 6	50½	9	2	33½	20½
7 to 8	46½	33	2½ to 4	35½	23½
9 to 12	41½	28	4½ to 6	34½	22½
			7 to 8	26½	14½
			9 to 12	21½	9½

From warehouses at the places named the following discounts hold for steel pipe.

	Black New York	Black Cleveland	Black Chicago
⅜ to 3 in. butt welded	47%	43½%	57½%
3½ to 6 in. lap welded	42%	45½%	53½%
	Galvanized New York	Galvanized Cleveland	Galvanized Chicago
⅜ to 3 in. butt welded	31%	34½%	44%
3½ to 6 in. lap welded	27%	30½%	41%

Malleable fittings, Class B and C, from New York stock sell at list plus 12½%
Cast iron, standard sizes, 10%.

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York Current	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Hot pressed square	$1.50	$2.50	$2.25	$1.40	$2.00	$1.05
Hot pressed hexagon	1.50	2.50	2.25	1.20	2.00	.85
Cold punched square	1.50	2.50	2.25	.75	1.30	1.50
Cold punched hexagon	1.50	2.50	2.25	.75	1.30	1.50

Semifinished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	50–10–75%	40%
Chicago	50%	50%
Cleveland	60–10–10%	60%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
⅜ by 4 in. and smaller	50%	50%	50–10%
Larger and longer up to 1 in. by 30 in.	40%	40%	40–10%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:
New York..... $1.25 Cleveland..... $3.75 Chicago..... $2.25
For cast-iron washers the base price per 100 lb. is as follows:
New York..... $4.00 Cleveland..... $3.75 Chicago..... $4.00

CONSTRUCTION MATERIALS

ROOFING MATERIALS—Prices per ton f.o.b. New York and Chicago:

	Carload Lots N. Y.	Carload Lots Chicago	Less Than Carload Lots N. Y.	Less Than Carload Lots Chicago
Tar felt (14 lb. per square of 100 sq.ft.)	$60.00	$60.50	$61.00	$61.50
Tar pitch (in 400-lb. bbl.)	21.00	18.00	22.00	19.00
Asphalt pitch (in barrels)	34.00	34.00	37.50	37.50
Asphalt felt	63.00	63.00	67.50	67.50

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows in New York, St. Louis, Chicago and San Francisco:

	1-Ply c.l.	1-Ply l.c.l.	2-Ply c.l.	2-Ply l.c.l.	3-Ply c.l.	3-Ply l.c.l.
No. 1 grade	$1.50	$1.75	$1.90	$2.15	$2.30	$2.55
No. 2 grade	1.35	1.60	1.70	1.95	2.05	2.30

Asbestos asphalt-saturated felt (14 lb. per square) costs $156 per ton.
Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $2.25 per roll in carload lots and $2.50 for smaller quantities.
Shingles, red and green slate finish, cost $6.00 per square in carloads, $6.25 in smaller quantities, in Philadelphia.

HOLLOW TILE—

	4x12x12	8x12x12	12x12x12
St. Paul	$0.056	$0.11	$0.162
Seattle	.09	.175	.30
Los Angeles*	.082	.154	.236
New Orleans	.165	.22	.325

*F. o. b. factory, 4, 8 and 10 inch.

LUMBER—Price per M in carload lots:

	8 x 8-In. x 20 Ft. and Under			12 x 12-In. 20 Ft. and Under	
	P.	Fir	Hemlock	Spruce	P.	Fir
Boston	$50.00	$49.00	$48.00	$48.00	$50.00	$50.00
Kansas City	45.50	50.25	50.25	52.25	51.50	51.25
Seattle	.....	.....	.....	.....	.....	30.00
New Orleans	45.00	.....	.....	.....	48.00	.....
St. Paul	60.00	61.00	60.00	.....	62.00	63.00
Denver			No quotations			
Atlanta	55.50	57.50	58.00	68.00	68.50	70.50

	1-In. Rough, 10 In. and Under	x 16 Ft.		2-In. T. and Gr. 10 In. x 16 Ft.	
	P.	Fir	Hemlock	P.	Fir
Boston	$50.00	$50.00	$48.00	$50.00	$50.00
Kansas City	64.50	72.75	72.75	67.25	79.00
Seattle	.....	30.50	.....	.....	30.50
New Orleans	55.00	.....	.....	50.00	.....
St. Paul	58.00	55.00	54.00	63.00	56.00
Denver			No quotations		
Atlanta	80.00	85.00	.....	65.00	67.50

NAILS—The following quotations are per keg from warehouse:

	Mill Pittsburgh	St. Louis	Dallas	Chicago	San Francisco
Wire	$3.25	$3.90	$5.00	$3.90	$5.00
Cut	4.25	5.40	6.40	5.00	6.65

PORTLAND CEMENT—These prices are for barrels in carload lots, without bags.

	Current	One Month Ago	One Year Ago with Bags
New York	$2.30	$2.30	$2.50
Jersey City	2.27	2.27	2.50
Boston	2.42	2.42	2.87
Chicago	2.00	2.00	2.90
Pittsburgh	2.05	2.05	2.71
Cleveland	2.32	2.32	2.15
Denver	2.67	2.67	3.07

Note—Charge for bags is generally 15c. each, 60c. per bbl.

LIME—Warehouse prices:

	Hydrated per Ton		Lump per 300-Lb. Barrel	
	Finished	Common	Finished	Common
New York	$17.50	$14.50	$2.90	$2.65
Kansas City	22.00	21.00	2.30	2.20*
Chicago	18.00	17.50	1.80*	1.10*
St. Louis	.....	18.00	.....	1.75*
Boston	22.75	18.25	3.65	3.30
Dallas	2.25*	1.25*	.....	.....
San Francisco	19.00	.....	.....	2.00*
St. Paul	23.00	20.00	1.60*	1.50*
New Orleans	.....	10.00	.....	11.00‡
Atlanta	.....	1.90*	1.75*	1.75*
Denver	20.00	20.00	.....	2.15‡

* 200-lb. barrels. † Per 180-lb. bbl. ‡ Per ton.
Note—Refund of 10c. per barrel.

LINSEED OIL—These prices are per gallon:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Raw per barrel	$2.15	$1.86	$2.15	$2.00	$2.48	$1.97
5-gal. cans	2.28	1.96	2.40	2.15	2.68	2.17

WHITE AND RED LEADS—in 500-lb. lots sell as follows in cents per pound:

	Red				White	
	Current		1 Year Ago		Current	1 Yr. Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
100-lb. keg	13.00	14.50	14.00	14.50	13.00	14.00
25- and 50-lb. kegs	13.25	14.75	14.25	14.75	13.25	14.20
12½-lb. keg	13.50	15.00	14.50	15.00	13.50	14.50
5-lb. cans	15.00	16.50	.....	.....	15.00	16.00
1-lb. cans	16.00	17.50	.....	.....	16.00	17.00

MINING AND MILLING SUPPLIES

HOSE—

	Fire	
		50-Ft. Lengths
Underwriters' 2½-in.		70c. per ft.
Common, 2½-in.		40–10%

	Air		
	First Grade	Second Grade	Third Grade
¾-in. per ft.	$0.45	$0.30	$0.20

Steam—Discounts from List

First grade..... 35% Second grade..... 45% Third grade..... 50%

LEATHER BELTING—Present discounts from list in the following cities are as follows:

	Medium Grade	Heavy Grade
New York	45%	35%
St. Louis	45%	35%
Chicago	45%	40%
Birmingham	30%	35%
Denver	35–5%	30%

RAWHIDE LACING—30% off for cut; 62c. per sq.ft. for side lacing.

MANILA ROPE—For rope smaller than ⅝-in. the price is ½ to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ⅝-in., 8 ft., ¾-in., 6; ⅞-in., 4½; 1-in., 3½; 1¼-in., 2 ft. 10 in.; 1½-in., 2 ft. 4 in. Following is price per pound for ⅝ in. and larger, in 1200-ft. coils:

Boston	$0.25	Denver	$0.29½
New York	.27	Kansas City	.28
Cincinnati	.29	New Orleans	.27½
Chicago	.26½	Seattle	.27½
St. Paul	.28	St. Louis	.26½
San Francisco	.26	Atlanta	.29½

PACKING—Prices per pound:

Rubber and duck for low-pressure steam	$0.90
Asbestos for high-pressure steam	1.50
Duck and rubber for piston packing	1.00
Flax, regular	1.20
Flax, waterproofed	1.60
Compressed asbestos sheet	.90
Wire insertion asbestos sheet	1.10
Rubber sheet	.50
Rubber sheet, wire insertion	.70
Rubber sheet, duck insertion	.50
Rubber sheet, cloth insertion	.30
Asbestos packing, twisted or braided and graphited, for valve stems and stuffing boxes	1.20
Asbestos wick, ½- and 1-lb. balls	.85

REFRACTORIES—Following prices are f. o. b. works, Pittsburgh:

Chrome brick	net ton	$90–1.00	at Chester, Penn.
Chrome cement	net ton	45–50	at Chester, Penn.
Clay brick, 1st quality fireclay	net ton	35–45	at Clearfield, Penn.
Clay brick, 2nd quality	net ton	30–35	at Clearfield, Penn.
Magnesite, dead burned	net ton	32.50	at Chester, Penn.
Magnesite brick, 9 x 4½ x 2½ in.	net ton	80–90	at Chester, Penn.
Silica brick	net ton	41–45	at Mt. Union, Penn.

Standard size fire brick, 9 x 4½ x 2½ in. The second quality is $4 to $5 cheaper per 1000.

St. Louis—Fire Clay, $30 to $40.

Birmingham—Fire clay, $41–$44; silica, $46.50-$54.50; magnesite, $80–$85; chrome, $80 to $90.

Chicago—Second quality, $25 per ton.

Denver—Silica is $35 per 1000.

RAILWAY TIES—For fair size orders, the following prices per tie hold:

	Material	7 In. x 9 In. by 8 Ft. 6 In.	6 In. x 8 In. by 8 Ft.
Chicago	Plain	1.48	1.33
San Francisco	Douglas Fir—Green	1.42	1.00
San Francisco	Douglas Fir—Creosoted	2.12	2.00

Prices per tie at Missouri mills; St. Louis prices about 25c. higher:

Untreated A Grade White Oak 6x8x8		Untreated A Grade Red Oak 6x8x8	
No. 1	$0.70	No. 1	$0.55
No. 2	.80	No. 2	.65
No. 3	.90	No. 3	.75
No. 4	.98		
7x9x8 white oak	1.05		
7x9x8 red oak, No. 4	.80	No. 5	.87

FLOTATION OILS—Prices of oils for flotation, in cents per gallon, in barrels

	New York	Chicago In Bbl.	Chicago Carloads	Denver
Pure steam-distilled pine oil, sp.gr. 0.925-0.94	$0.78	$0.71	$0.69	$ 0.81
Pure destructively distilled pine oil	.68	.68†	.66†	.53–.68
Pine tar oil, sp.gr. 1.02—1.035	.45	.36	.34	.40–.47
Crude turpentine	.72	.68	.66	.53–.63
*Hardwood creosote, sp.gr. 0.96–0.99	.27	.....	.....	.50–.57

* F.o.b. Cadillac, Mich,

COTTON WASTE—The following prices are in cents per pound:

	New York Current	New York One Year Ago	Cleveland	Chicago
White	13.00	11.00	14.00	11.00 to 14.00
Colored mixed	9.00 to 12.00	8.50–12.00	11.00	9.50 to 12.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½x13½	13½x20½
Cleveland	$52.00	$58.00
Chicago	41.00	43.50

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb. keg for black powder:

	Low Freezing 20%	Gelatin 40%	Gelatin 60%	Gelatin 80%	Black Powder
New York	.....	$0.27½	$0.30	.....	$2.40
Boston	$0.22½	.24½	.26½	$0.31	2.20
Cincinnati	.19½	.21½	.23½	.....	2.25
Kansas City	.19	.23½	.26½	.30	2.45
New Orleans	.....	.22½	.24½	.....	.....
Seattle	.14½	.18½	.25½	.31½	1.90
Chicago	.18½	.21½	.25½	.29½	2.15
St. Paul	.19	.23½	.26½	.....	2.45
St. Louis	.19	.23½	.25½	.30	2.40
Denver	.17½	.22	.24½	.28½	2.25
Dallas	.189	.225	.228	.342	.....

CHEMICALS

SODIUM CYANIDE—New York price is 31c. per lb.; Denver, 42c.; Chicago, 31½c.; St. Louis, 31c.

SODIUM SULPHIDE—In New York the price per pound is .05c. for concentrated, 2c. for crystals. The St. Louis price is 5c. for concentrated. The Denver price is 32c. The Chicago price is 6c. for concentrated, 3½c. for crystals. Concentrated comes in 500-lb. drums, the crystals in 440-lb. bbl.

ZINC DUST—For 350 mesh the New York price is 10c. per lb.; Chicago, 13c., Denver, 13c. St. Louis, 15c.

ALUMINUM DUST—Chicago price is 1.30 per lb.

MINERS' LAMP CARBIDE—Prices net f.o.b. cars at warehouse points.

	Union 100-Lb. Drums Per Ton	Cameo 100-Lb. Drums Per Ton	Union 25-Lb. Drum Per Drum
East of the Mississippi, North of Chattanooga	$106.00	$101.00	$1.52
Southeastern portion U. S. A.	115.50	110.50	1.63
Texas (except El Paso)	124.00	119.00	1.74
El Paso, Texas	126.00	121.00	1.77
Denver, Colo	124.00	119.00	1.74
West Coast	129.00	124.00	1.81